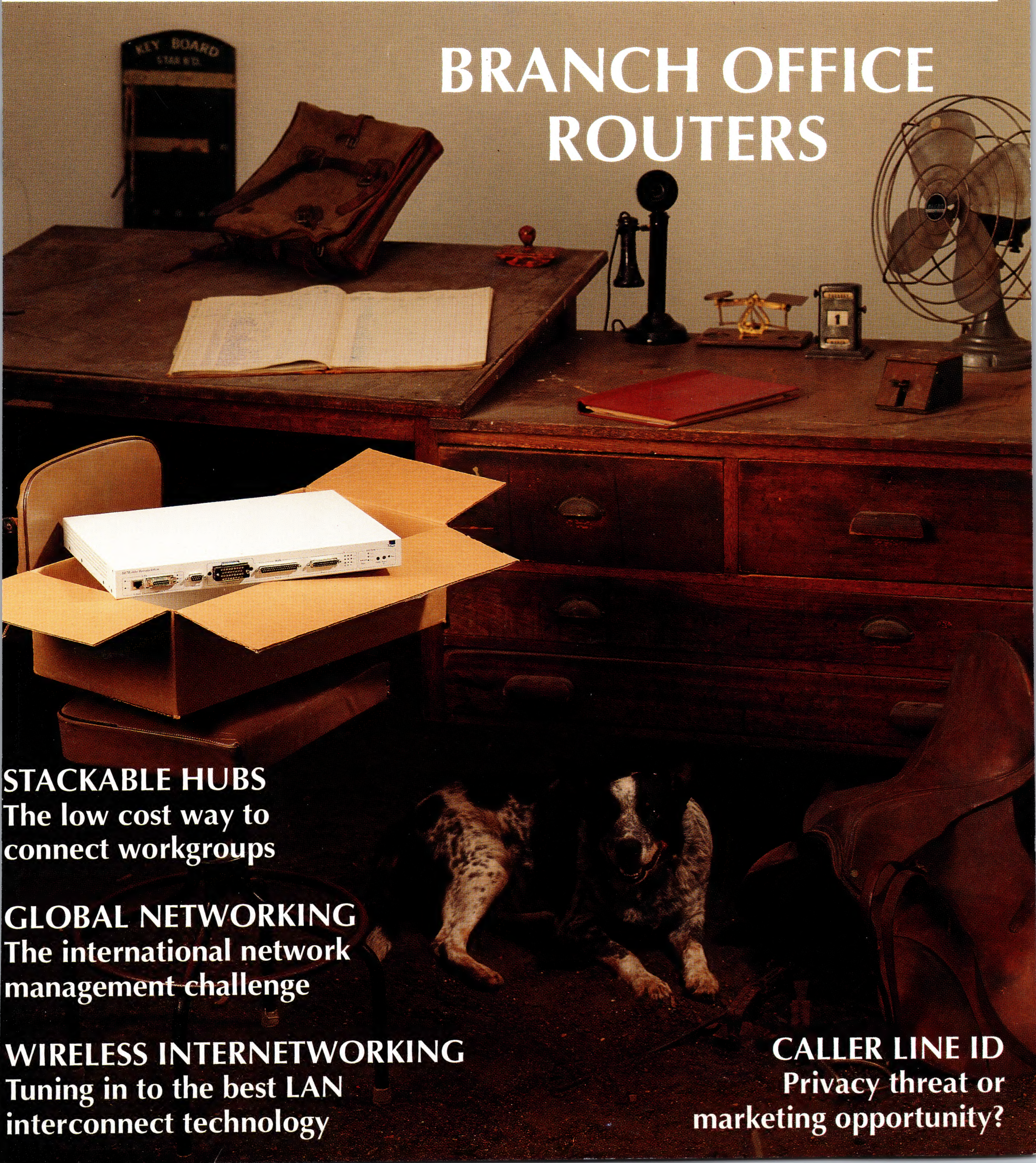
AUSTRALIAN

communications

MARCH 1994 The Networking and Telecommunications Management Magazine $5.50



BRANCH OFFICE ROUTERS

STACKABLE HUBS
The low cost way to connect workgroups

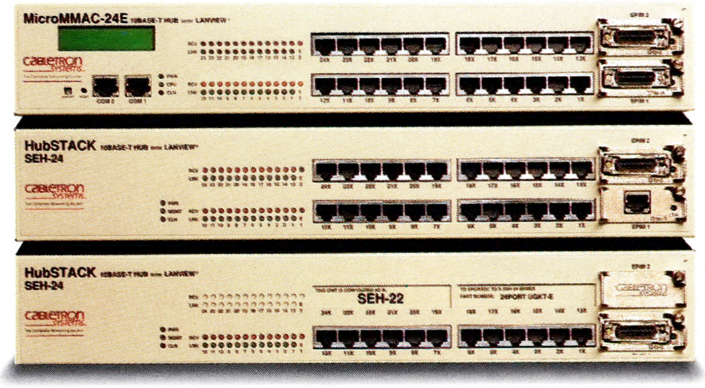
GLOBAL NETWORKING
The international network management challenge

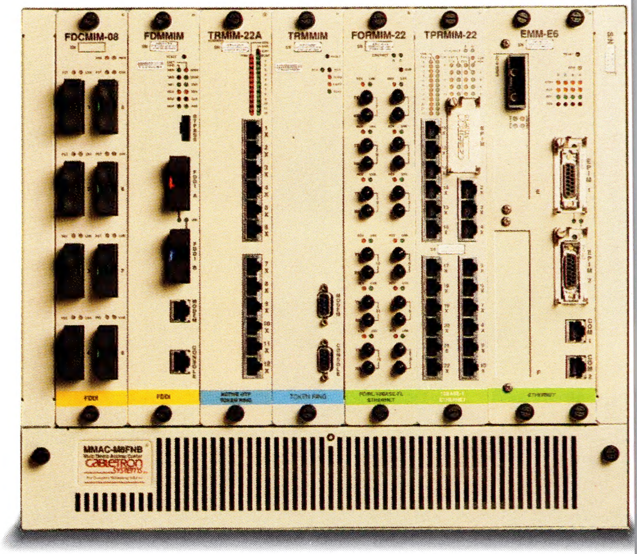
WIRELESS INTERNETWORKING
Tuning in to the best LAN interconnect technology

CALLER LINE ID
Privacy threat or marketing opportunity?

THE NEXT GE

FROM END TO END, CABLETRON





Remote Sites

Corporate Wiring Closets

The Next Generation Gap — it's that vast canyon between the revolutionary information networks of tomorrow, and the data networks you rely on today. How safely you cross over, and in what shape you find yourself, will depend largely on the vendor decisions you make in the months to come.

Many vendors have already announced their next generation solutions. Upon closer scrutiny, you'll find them to be nothing more than enhancements to existing technologies. Cabletron is about to unveil something

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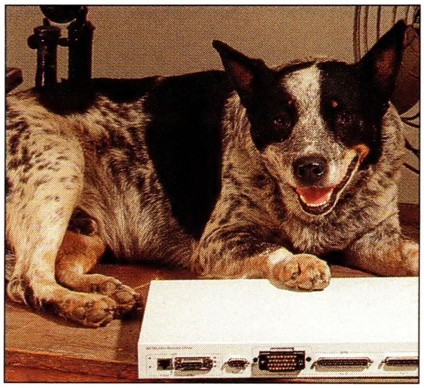
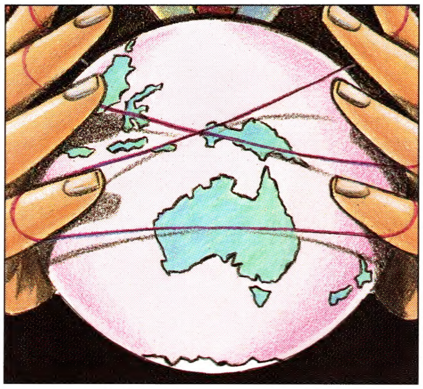
Cover: John Doughty



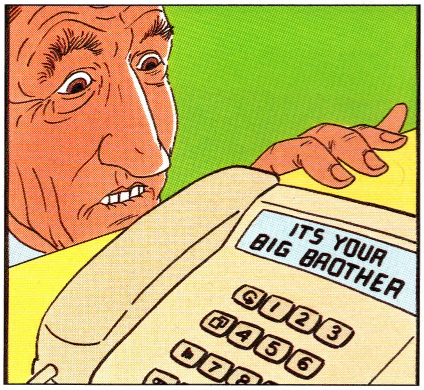
BRANCH OFFICE ROUTERS 67

Branch offices may be a long way from the big city, but these days they're anything but isolated: corporate e-mail, server, and database are now as close as the keyboard. After all, those who've opted for the less frenetic lifestyle of the bush still need to exchange e-mail with other employees, transfer files among departments, and tap into network resources. Sure, those tasks can be taken care of via modems and bridges, but a new breed of internetworking equipment known as access routers offer far better performance and much greater flexibility, while at the same time cutting the cost of linking up smaller branch sites.



MANAGING GLOBAL NETS 77

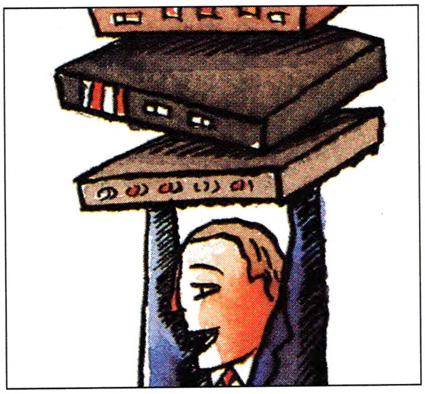
The days when the responsibilities of a communications manager were limited primarily to managing PABXs, monitoring the performance of leased circuits, passively reacting to increasing capacity requirements and reconciling communications bills are over. With the increasing importance of communications, the role of the comms manager includes a new emphasis on business development, marketing, and relationships with clients and suppliers — particularly when the corporate network extends beyond national boundaries. Fortunately, new developments in management tools, directory services and outsourcing can help.



CALLER LINE ID 87

Starting this month, Telecom plans to trial Caller Line ID technology in the NSW town of Wauchope, where more than 400 households and businesses will take part in the experiment. Like many CLASS (Custom Local Area Signalling System) enhancements, CLID raises serious privacy, intrusion, and general social issues, which are further complicated by the fact that the privacy issue flows two ways. It is a privacy issue if the carrier doesn't introduce CLID (assuming it can), and it's often a privacy intrusion if they do. Stewart Fist examines Caller Line ID functionality and the many important issues its implementation raises.

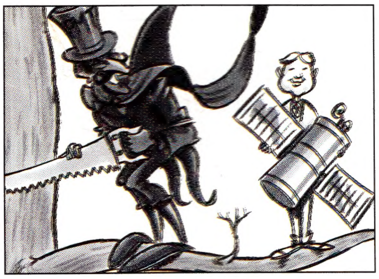
MARCH 1994



STACKABLE HUBS 95

Stackable Ethernet hubs can deliver the ports network managers need for a much lower cost than bus-based products. These products do the same basic tasks as conventional modular hubs, but with a difference: instead of being slotted into a hub chassis that has a high-speed bus, stackable hubs are connected by cables and are stacked on top of one another. Eliminating the bus enables vendors to slash the per-port price of stackables significantly. But to get the lower cost, managers have to sacrifice some features that they may take for granted with modular hubs, such as hot swapping of modules, the use of redundant power supplies, and the ability to configure LAN workgroups via software.

ANALYSIS



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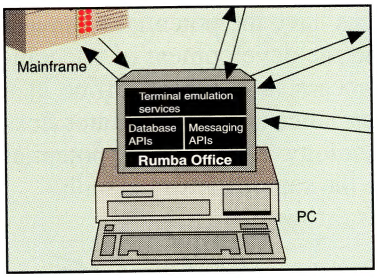

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The new EiconCard ISDN/PC adaptor helps provide personal computer users with ISDN connectivity.

55 A Speedy Solution Until V.fast
The new Hayes V.fast Class Optima 288 modem gives users effective data throughput at up to 230.4Kbps.

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65 Bill Melody argues that rapid advances in communications technology will pass Australia by unless we dismantle the carrier duopoly now.

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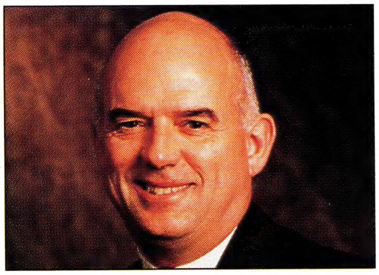
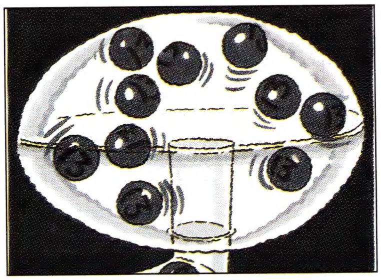


59 Jeff Carter
Jeff Carter is responsible for the enterprise companies, international activities and development of domestic and offshore business for TCNZ. Liz Fell spoke with him at PTC'94.

LEGAL LINE



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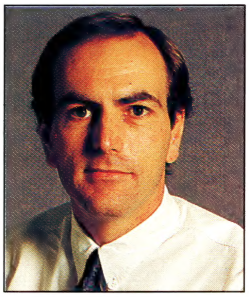
Before the Superhighway



With the creation of the Broadband Expert Services Group and Prime Minister Keating's audience with Bill Gates last month to hear his electronic superhighway gospel, it appears that discussion of new broadband communications networks and why we should have them has made it out of academia and into the mainstream. This is as it should be, but before we all get carried away it's worth noting that — Pay TV aside — no-one is quite sure what will be done with these networks.

As CIRCIT's Professor Bill Melody points out on page 65 in this issue: 'Research on the evolution toward the information society indicates that technology and supply are running a long way ahead of demand. For example, a CIRCIT survey of optical fibre-to-the-home experiments around the world showed a universal failure of demand. The multimedia experiments currently underway in the US and some other countries are desperately seeking a 'killer' service application that will stimulate large scale market development.'

Although not exactly a killer application, telecommuting has been put forward in the past as a prime driver for the construction of these superhighways. Telecommuting, particularly from home, has been fertile ground for futurologists in recent years but their predictions of a brave new world in which large numbers of people commute to work via the telephone network rather than public transport have so far, at least, proved a little wide of the mark. While the technology to telecommute has been available for some time, the fact is that in practice most people have found it to be slow, cumbersome and ultimately frustrating. This where the superhighway bit comes in. It's also where the subject of our cover story, the dramatically less glamorous branch office router, comes in as well.

While they're very short in the glamour department, the significance of branch office or access routers shouldn't be discounted — like the much-hyped superhighways these devices have the potential to have a significant impact on work practices and the development of telecommuting. These products offer remote access to a central office at a reasonable cost and with far better performance and much greater flexibility than that provided by modem technology. They have the potential to make telecommuting practical before the superhighway is built.

M Smeaton

AUSTRALIAN communications

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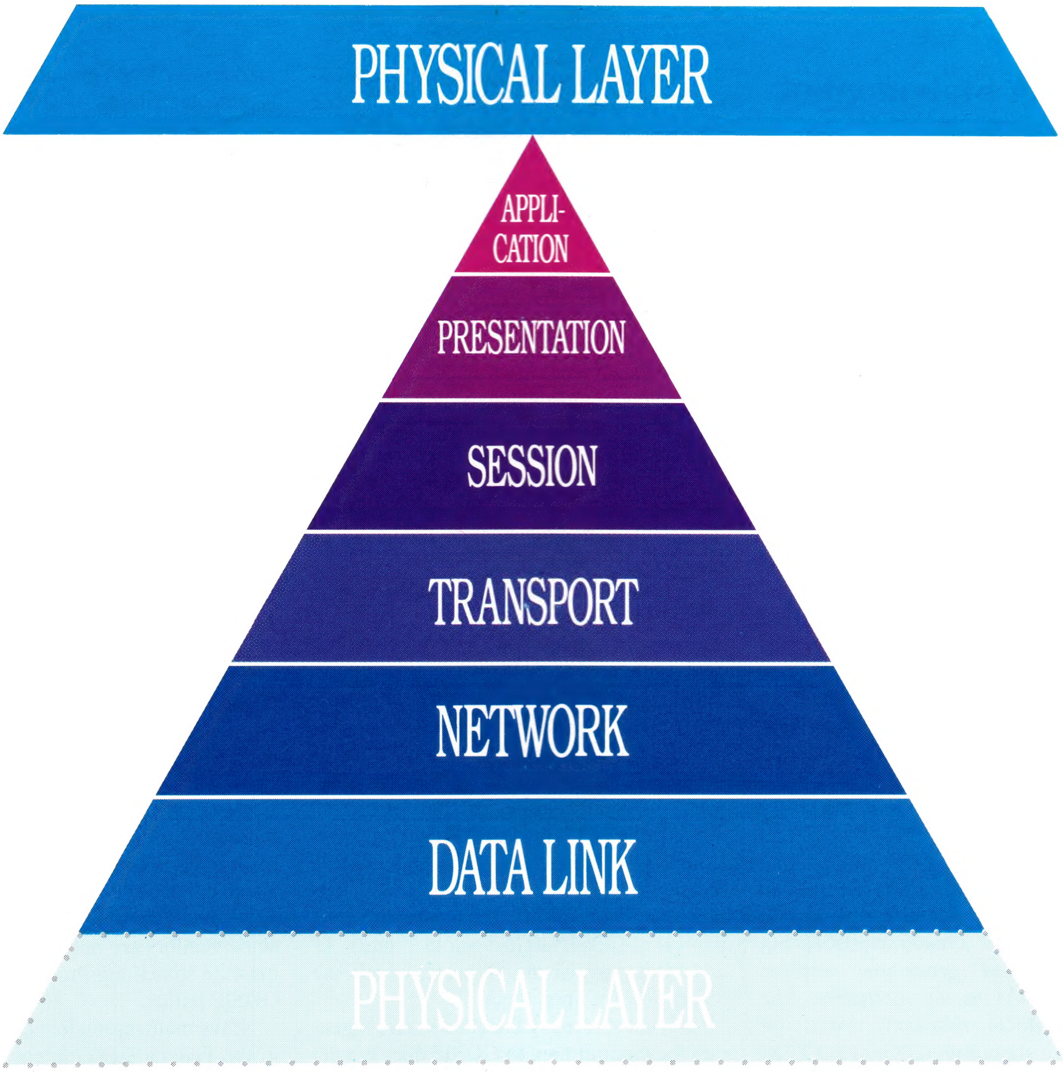

Are you making physical layer decisions a top priority?

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GOSIP: A Statement of Misdirection?

Why is it that despite the good intentions of governments around the world and the fanfare associated with the promotion of GOSIPs, the OSI marketplace remains so sluggish? It is now more than two years since the Government pledged its commitment to GOSIP (the Government Open Systems Interconnection Profile), yet during that time only a handful of government agencies have implemented it in any serious way. With significant resources committed to the GOSIP strategy, isn't it about time we stood back and looked at how that strategy is going?

The Statement of Direction for Australian GOSIP says the '. . . timing for and manner of, conversion of an agency's networks to OSI is entirely the responsibility of the agency . . .'. Further '. . . it is expected that agencies will use whole of life economic assessment methods taking into account the longer term benefits, as well as the short term costs, of adopting standards when making their decision . . .'.

One of the weakest points in this policy statement is its ambiguity. Let's say that an agency wants to transfer files to an external organisation on a regular basis. Virtually in all such cases there would be a suitable proprietary protocol already available, but the GOSIP-inclined agency may consider using OSI FTAM as an alternative. The proprietary protocol, most likely, is well supported by both organisations whereas FTAM may be completely new to one or even both organisations. Further, the proprietary protocol provides the interfaces that the users are familiar with, while with FTAM these interfaces may need to be developed. Proprietary protocols support enhanced features which FTAM doesn't support. The list goes on and on.

From the very beginning, these decisions almost invariably turn into 'feature wars' which almost always end up in favour of the proprietary products simply because of IT professionals' fear of the lesser known product. Also, since the proprietary products are being optimised for a particular environment they have the advantage over an OSI counterpart which is designed to be a generic product to work in diverse environments.

In this scenario, the GOSIP policy unfortunately provides a number of escape hatches for the decision-maker who may be wavering. When the argument is based on product features it is fairly simple to provide a long list of compelling reasons not to implement GOSIP. This argument can also be extended to provide very sound reasons why GOSIP is not cost effective and is not timely for the given exercise. An added benefit is that everyone gets a warm feeling thinking that they have done their best to abide by the GOSIP policy.

Only in the rare case when the IT professional making the decision is sympathetic towards the OSI cause does the OSI product get the seal of approval, invariably at the expense of cynicism from business counterparts and IT colleagues happy to perpetuate support for legacy systems.

Supporting the existing systems and enhancing the services provided by them is a less risky and safer business decision, whereas migrating to GOSIP is not. Migration to GOSIP means a culture change for the entire organisation requiring not only the development of new technical skills but also skills to take advantage of a 'deregulated' (i.e. independent from a particular vendor) IT market. However, what support or incentives does the GOSIP policy provide to facilitate this changeover? Not much.

In some cases even when the OSI product is more suitable, the organisations face another dilemma — business justification. Most projects that could utilise OSI products will have a limited budget and strict time constraints. Invariably, the implementation of OSI will be more costly in terms of skills development and relatively high risk because it usually strikes at the core of an organisation's IT infrastructure. IT professionals will claim that such costs could be recouped in future when other similar applications come on-line, but to most business managers GOSIP is just another fancy IT technology which the IT professionals are trying to force upon them.

It is not surprising then that in most agencies the commitment to GOSIP does not get beyond the IT strategy document, if they happen to have one. Most people are familiar with the claim, '. . . we need to wait for mature OSI products which suit our specific business requirements. When that happens we will migrate to OSI . . .'. Essentially the GOSIP policy has given them the freedom to take this course of action.

Real Commitment Required

One of the factors contributing to sluggish deployment of GOSIP is the dearth of OSI-compliant products. Most analysts believe that it is a 'chicken and egg' problem, but I feel it is a simple one of supply and demand.

If users want OSI they must create a demand for it and it's here that users such as the Australian Government can contribute by providing a firm timeframe within which it expects to migrate to GOSIP. As it is, it is not clear to anyone, let alone the suppliers, whether the intention is to see migration happening in 10, 20, 50 or even 100 years from now. Yet the Australian GOSIP Version 2 states that '. . . their [OSI standards] adoption is so fundamental to the future of information technology in Australia that a firm commitment from Central Government is essential to their successful implementation and to ensure that Australian Industry is not disadvantaged in competing in international markets for OSI-compatible products.' By leaving the timing of GOSIP implementation wide open, it almost appears as though the Government created an escape hatch for itself in the event agencies demanded funds for migrating their system.

In this regard, one must applaud the WA Government, which recently approved $1 million funding for an open system trial linking state, interstate and international organisations. The WA Government obviously views this as an opportunity to gain experience in OSI, and to boost research, development and export of associated technology. It is only through initiatives like this that Governments could secure benefits for the local IT industry — possibly the only major short-to-medium term benefit of migrating to OSI. Countries around the world who have committed to OSI clearly see this benefit. Some are known to offer tax concessions for locally developed GOSIP compliant products.

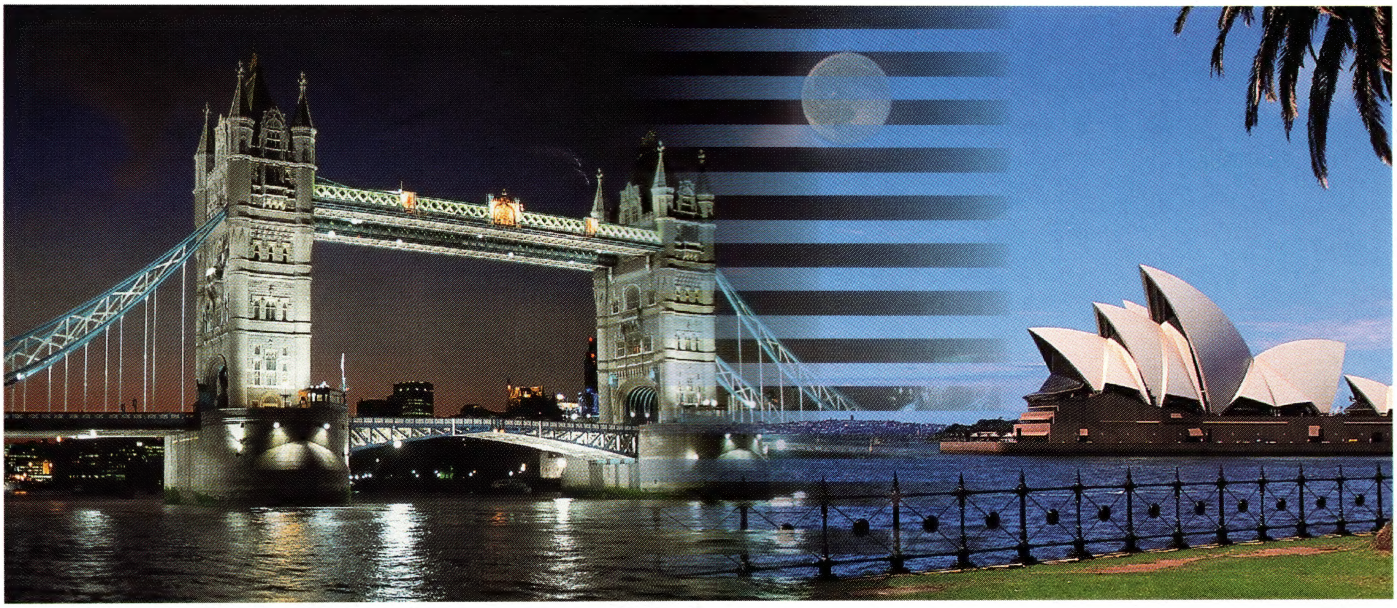
Government also needs to consider educating senior management about the business benefits of GOSIP. Most senior managers see GOSIP as a process initiated mainly for technological reasons and fail to realise that GOSIP is better for business because it provides greater freedom of choice for deploying IT. Some executives in Government agencies have even cast doubts about GOSIP in the media and the message here is clear — since vendors are not supporting OSI there must be something inherently wrong in the GOSIP policy.

If the main reason for adopting OSI within the Federal Government is the achievement of connectivity and interoperability within the agencies, it could achieve this goal by using OSI, TCP/IP or even IBM's APPC framework. It is simply not a major technological feat these days. But if the issue is limited to looking at the features offered by these different architectures then we are obviously on the wrong track. OSI is not so much about products offering the ultimate in technology but rather a strategy to move away from proprietary systems.

As an implementor of OSI, the only valid criterion to me is that it be a user-driven process and beneficial to all users. The benefits *are* clear and they have been covered in various GOSIP documents so many times. It is up to the users to stimulate the demand for OSI products. The Australian Government as a major user of IT must provide a firm commitment and, more importantly, provide support for OSI which can be unambiguously translated into action by its agencies. Otherwise GOSIP could possibly end up, at best, only a partially successful policy, the cost of which could be significant to the Australian taxpayer.

Guptila de Silva
Australian Taxation Office, Canberra

[The views expressed are those of the author alone and do not necessarily reflect those of the Australian Taxation Office.]



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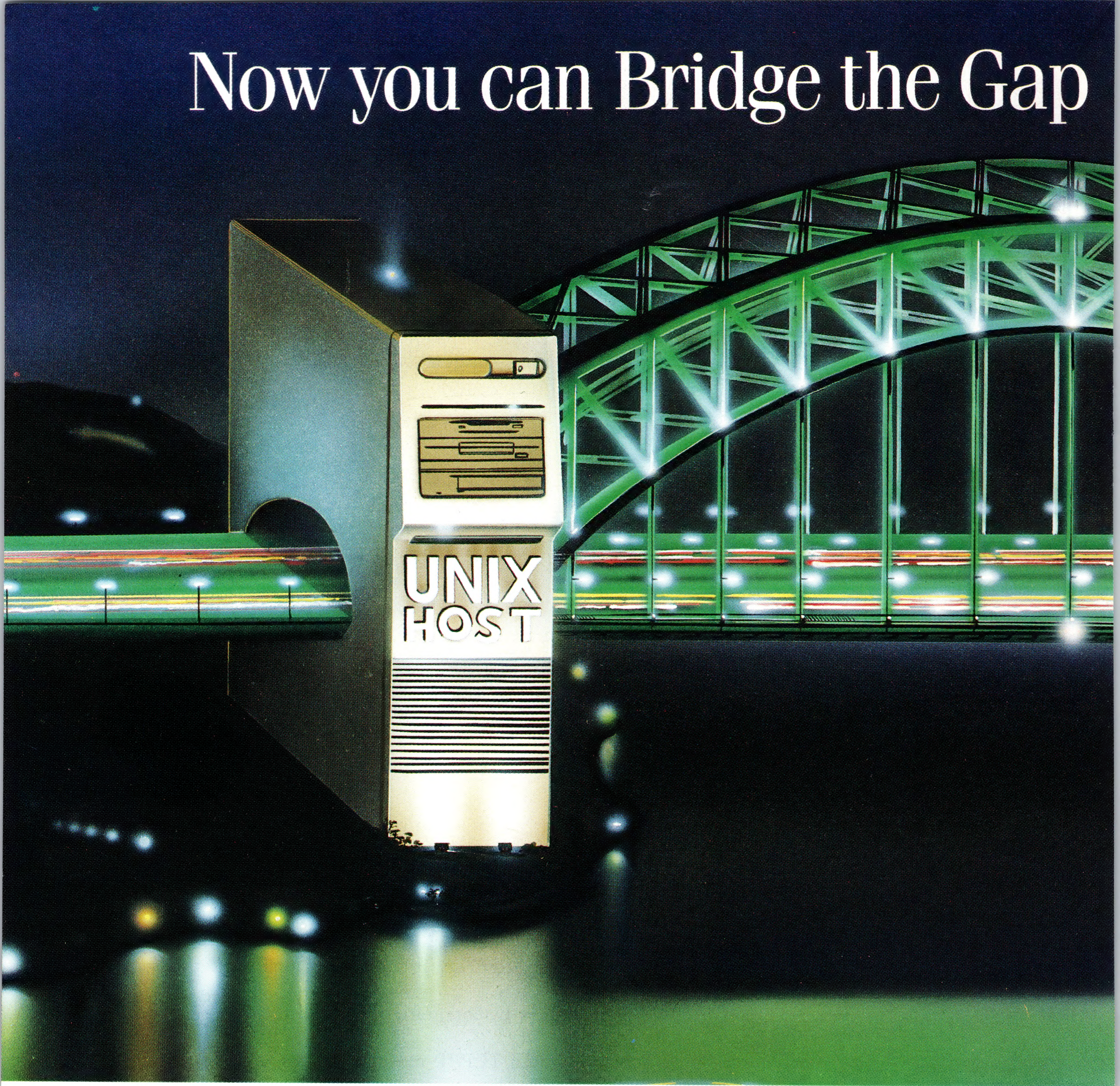
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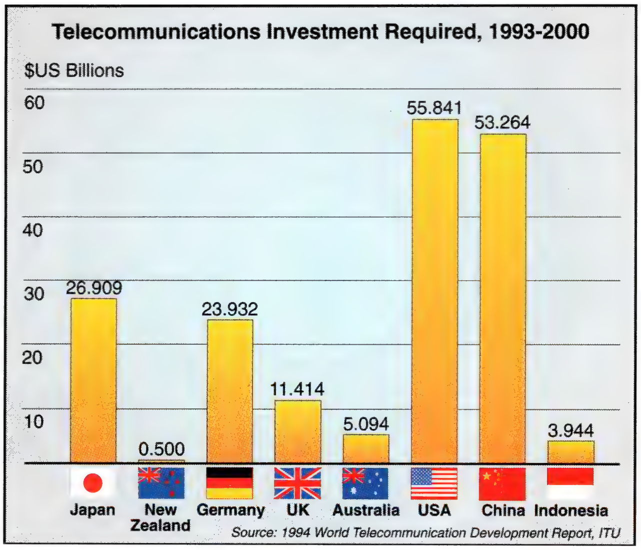

Source: 1994 World Telecommunication Development Report, ITU

Australia Needs $7b Investment — ITU

Australia needs an investment of around $US5.09 billion ($A7.17 billion) to fund projected main telephone line development to the year 2000, according to the 1994 World Telecommunication Development Report from the International Telecommunications Union (ITU).

The Report predicts a growth rate in main line numbers for Australia of 4.4% per annum, resulting in an extra 3.4 million lines added by the year 2000. Assuming the ITU's prediction is correct, Australia's ratio of main lines per 100 inhabitants will increase from 45.90 in 1992 to 59.01 in 2000.

Nations expected to expend the most on telecoms development from 1993 to 2000 include: the US ($US55.8 billion), South Korea ($US43.7billion), Turkey ($US55.1 billion) and China ($US53.2 billion).

Telstra Boosts Infonet Stake

Telstra has increased its shareholding in Infonet from 5.38% to 7.2%, after Infonet's largest shareholder, MCI, divested itself of its 25% interest in the global networking company.

The move by MCI is part of a strategy to relinquish international investments, and is a result of last year's acquisition by BT of 20% of MCI.

Ten of the world's leading telecommunications carriers enlarged their stakes in Infonet on a pro rata basis.

The largest shareholders remain France Telecom's Transpac and Deutsche Bundespost Telekom, which now each have 21.6%. Joining Telstra with a 7.2% shareholding are Belgium's Belgacom, Swiss Telecom PTT, Spain's Telefonica, Sweden's Telia, and Netherlands PTT. Japanese giant KDD holds a 6.2% stake.

ASTEC to Study Network Needs

The Federal Government has commissioned a study to determine Australia's requirements for research data networks.

The study will be undertaken by a six-person working party from the Australian Science and Technology Council (ASTEC), and will be chaired by Professor Ann Henderson-Sellers from the Macquarie University in Sydney. It will look particularly at the role of AARNet in meeting future information and communications needs and is expected to deliver its report sometime mid-year.

Its terms of reference are: the examination of the use of research data networks by universities, government research organisations, the education sector, and industry; the examination of the role of research networks in providing services for the wider community, and the method of provision of these services; and the recommendation of appropriate actions that might be taken by the Commonwealth Government. Opening AARNet up to commercial users is an area which will also be covered.

When Bill Met Paul

A Bill Gates visit is increasingly like an old-fashioned royal tour, when politicians would go to great lengths to be granted an audience in order to appear as both important enough to warrant one and loyal enough to deserve one.

So it was in February when Prime Minister Paul Keating was granted an hour-long audience during the Microsoft CEO's busy three-day tour of Australia.

Bill Gates

Initial press reports had it that Bill's royal progress could not be altered in order to accommodate the Australian PM but the demands of protocol (and wiser heads in the Microsoft court) prevailed and the meeting took place in the PM's Canberra office. Also present at the meeting were Communications Minister, Michael Lee, and Microsoft's Director, Asia Pacific Region, Daniel Petre.

Having established his worthiness by gaining the meeting, Mr Keating was then able to demonstrate his loyalty to the high-technology cause by having what the Microsoft public relations machine said was a wide-ranging discussion with Mr Gates on all aspects of the information age — including 'digital electronic highways.'

AT&T Swallows Last NCR Bite

Some three years after its buyout by AT&T, NCR has announced it has changed its name to AT&T Global Information Solutions. The new name and AT&T logo will replace the NCR brand and logo on all the company's products, excepting some retail, financial and business items where the NCR brand is considered to have better brand recognition. It is likely that the NCR name will remain on the company's ATM and EFTPOS terminals.

CEO Jerry Stead said the new name reflects the integration of computing and communications and the combined capabilities of the new organisation. The name change was the result of extensive market research, surveying customers and industry participants in 10 countries.

New Australian Managing Director, Mike Lee, who now bears the hefty title of Managing Director, AT&T Global Information Solutions, South Pacific Area, said NCR had gone through "tremendous change since the AT&T acquisition."

He added that the change was not yet complete and may involve further staff losses, perhaps up to 10% of the company's 1,240 staff in Australia and New Zealand.

Mike Lee

Mr Les Harris (left), Programme Director, BT Australasia, with Minister for Administrative Services, Anne Cohen, and NSW Premier John Fahey

Fahey Launches NSW Private Network

NSW Premier, John Fahey, last month launched his Government's new private voice and data network at the network's Sydney Management Centre.

Speaking at the launch, Mr Fahey said the network, which was supplied by BT, will save NSW taxpayers some $280 million during the next 10 years. He said work on the network has already resulted in 230 new jobs, and added that, with over 90 Australian companies on BT's preferred supplier list, the enterprise would have long term beneficial effects for the IT industry.

Mr Les Harris, Programme Director for BT Australasia, said that BT regards the enterprise as "a flagship in telecommunications, which will be a model for the rest of the world to look to." The NSW network represents the single largest contract of its type BT has undertaken outside the United Kingdom.

The network is a hybrid of a private network and a virtual private network. Ultimately, it will connect some 5,000 sites around NSW, and will incorporate over 120,000 telephones and 23,000 computer terminals.

Vanuatu Buys Stanilite Phones

Pacific Island nation Vanuatu has selected Stanilite Pacific's Cellswitch telephone system to form the basis of its cellular infrastructure. The contract follows a trial of the system during the South Pacific Mini Games, which were staged in Vanuatu in December last year.

To be maintained by Telecom Vanuatu engineers trained by Stanilite, the new Cellswitch network will operate using an AMPS standard protocol, which Stanilite claims is more cost-effective than using the digital GSM standard. Stanilite officials also said that the fact that the AMPS standard is still predominant in countries like Australia, New Zealand and the US was an important factor in Vanuatu's decision.

Ipex Wins Novell Approval

Melbourne-based Ipex Information Technology has won full accreditation as a Novell Authorised Testing Centre (NATC). The firm is one of only four organisations worldwide to hold the accreditation, and the first outside the US to be accredited.

Ipex established its Test Laboratories in Sandringham during 1992 at a cost of over $1 million. Technicians at the facility perform a wide range of tests including performance benchmarking, functional testing, interoperability testing and product evaluation in a range of different environments.

A spokesperson from Ipex said the new NATC is expected to generate ten new jobs, and will earn the company several million dollars in exports.

In Brief

Ascom Timeplex has signed a Memorandum of Understanding with Telecom to become part of its Enhanced Distribution Channel Program. Under the terms of the agreement, both companies will enhance their customer offerings by providing business packages combining both organisations' products and services.

Ipex ITG has won a contract to provide a routed backbone system for the Bank of Queensland's head office in Brisbane. The backbone is designed around 3Com's NETBuilder II routers and will provide access to Novell hosts, Unix servers and OS/2 servers.

Datacraft has completed the installation of what it claims is the largest wide area network in Western Australia. Designed for the WA Department for Community Development, the new LINKS network enables 55 sites throughout the State to access a central database. It is based on Datacraft AP4000 OpenRouter products and makes extensive use of ISDN.

Siemens Nixdorf has secured a contract for the staging and installation of a new branch telling platform for the Commonwealth Bank. The two-year project involves installing a LAN-based telling system in over 1,000 of the bank's branches around Australia.

NorTel's Australian Managing Director, John Kranenburg, is to be Honorary Chairman and Speaker at the IC&C 1994 Business Summit sponsored by the IC&C World Leaders Council.

Comperex Australia has won Xylogics International's award for International Distributor of the Year. Alan Law, Xylogics' International Vice President, said Comperex won the award because of the company's outstanding sales and support of the Annex range of terminal and remote access communications servers.

ERG has sold out its 9.3% share in Exicom for a gross profit of $4.3 million. ERG originally bought its 9.41 million shares in Exicom for an average of 81 cents, and sold the shares as a parcel for $1.28 each, for a total of $12.05 million.

Osborne Computers Australia has signed an agreement with AT&T whereby Osborne will resell the entire range of AT&T Global Information Solutions' servers, making it the largest reseller of AT&T midrange servers in Australia and the South Pacific.

pTIZAN, an Australian IT integrator and developer, has won the exclusive right to modify AT&T secure communications products for sale to Australian government agencies.

Telecom has signed an agreement with the Health Insurance Commission to provide EDI network transmission services. The network services, which will be provided by Telecom Plus, will facilitate a new system known as Medclaims, which will allow medical practitioners to lodge Medicare claims electronically.

Olex Cables has installed a road tollway system on 40km of new motorway which links the Queensland resorts of Coolum and Noosa. The system uses optical fibre to control tolls, security and emergency communications, and carries voice, video and data.

Jtec's J1000 Access Controller was the winner of the Hardware/Software Product of the Year award at the 10th Australian Information Technology Awards held in Melbourne recently. Jtec recently signed a contract worth up to $40 million with BT for supply of the J1000 for use in BT's own network in the UK.

Saturn Global Network, the Australian-based VAN provider, has announced it is to establish an office in London, from where it intends to expand its operations into the European market.

Hayes, one of the world's leading manufacturers of PC modems, has opened an office in Sydney. General Manager, Hayes Asia Pacific, Mr Andy Ng, said the new office is part of the company's strategy to widen its presence in the Pacific Rim region.

Consultel has been awarded a three-year contract worth $2.4 million to install and manage a PABX for the Defence Science and Technology Organisation and neighbouring RAAF Base Edinburgh in Salisbury, South Australia. The new system requires $1.1 million of new equipment, and will comprise 3,700 telephone extensions connected to the new PABX.

Brisbane is next in line to vote in the phone ballot between Optus and Telecom for international and long distance calls. Polling for subscribers in the (07) region will commence on March 16.

In Brief

Intel last year recorded a leap of 50% in revenues to $US8.78 billion and a massive 115% boost in net income to $US2.3 billion. Intel also last year boosted its staff levels 14% to around 29,500 yet still managed to boost its revenue per employee result to $US318,000 compared to $US144,000 five years ago.

SynOptics enjoyed another record year in 1993 with revenues growing by 81% to reach $US704.4 million and net income rising by 78% to $US75.8 million. During the year, SynOptics shipped 4.5 million network nodes, doubling its installed base.

Northern Telecom has signed a contract with new UK carrier, Ionica, to supply radio-based telephone network equipment. The radio technology to be supplied connects home subscribers to public exchanges by radio, radically undercutting traditional wire-line-based connection costs. Northern Telecom has also signed an MoU with Telecom Finland for the supply of similar equipment.

3Com has announced plans to acquire US networking companies Synernetics and Centrum Communications. Synernetics specialises in Ethernet and FDDI switching technologies, and 3Com will acquire the company for $US104 million. Centrum Communications supplies remote network access systems for single user remote access to enterprise networks, and 3Com will spend $US36 million on its acquisition.

SEA-EUR, a proposed new high capacity fibre optic cable linking Europe with South East Asia and the Indian Ocean has moved a step closer to fruition with the recent announcement of a feasibility study into the concept. France Telecom, Singapore Telecom, AT&T and KDD of Japan have agreed to the new study under two separate Memoranda of Understanding.

Coopers & Lybrand has signed a worldwide licensing agreement with Lotus Development Corporation for the Lotus Windows desktop SmartSuite and Lotus Notes workgroup networking software packages. The initial agreement involves the purchase of 28,000 copies of Notes and other applications.

Hewlett-Packard has announced a strategic alliance with Nokia to develop Intelligent Network technology. The companies will focus jointly on Service Control Point development with Nokia's Service Management System (SMS) used to manage services created by HP's Service Creation Environment (SCE).

BT has announced plans to change its pricing structure from a unit based system to actual time used. Rival Mercury Communications has welcomed the move on the grounds that it will allow direct comparisons to be made between the two operators.

France Telecom has extended its local call zones as part of a general rebalancing of tariffs. The carrier says that the changes mean that each subscriber will be able to call seven times more people at the local rate than before.

Ericsson has won a contract worth $38 million with the China National Technical Import and Export Corporation (Beijing) and ChongQing Telecom Bureau of Sichuan Province for the delivery of AXE 10 switching and transmission equipment. All equipment will be delivered this year from Ericsson's Swedish factories.

Lotus has posted a 103% rise in net income to $US29.6 million for its fourth quarter ended December 31, 1993. Fourth quarter revenue rose 13% to $US278.3 million.

Oftel, the UK telecommunications regulatory authority, has said it intends to let operators take the lead in the introduction of number portability. An Oftel spokesman said the industry watchdog was working on a direction to BT to provide number portability for those operating companies who had made an approach.

Comsat has announced a promotional tariff that provides as many as six months of free VSAT service to encourage the establishment of VSAT networks in the Pacific Ocean Region. The company is now offering five-year VSAT leases on an inclined-orbit satellite at 177 degrees east longitude and later this year on a higher power Intelsat VII satellite.

Telecom Corporation of New Zealand has reported a 15.3% rise in profits to $NZ386 million for the nine month period ending December 31, 1993. Revenues rose by 0.7% compared to the same period last year to $NZ1,853 million.

FCC Starts Global Mobile Race

In a move which may signal the start of the global mobile communications race, the US Federal Communications Commission (FCC) has proposed regulations for the licensing and operation of mobile satellite systems.

Although the FCC's jurisdiction only applies to the US, its approval has always been an important precondition for many of the investors in the several rival systems planned. These systems are mostly backed by large consortia and include Iridium, headed by Motorola, and Ellipso, which has recently signed Westinghouse to develop and integrate its satellite communications infrastructure. The FCC has made global coverage a requirement under its proposed regulations.

The FCC regulations cover the 1610-1626.5/2483.5-2500MHz frequency bands and are based on applications filed by CDMA and FDMA/TDMA LEO satellite proponents, said FCC Commissioner, Andrew Barrett.

They are designed to accommodate up to five systems but if mutual exclusivity cannot be resolved among the qualified applicants then an alternative auction or lottery allocation plan has been proposed. In either case the FCC is determined to award at least two licences.

Barrett also warned would-be speculators off by urging that "our proposed rules do not provide room for speculative applicants to encumber this spectrum or receive unjust enrichment by selling undeveloped spectrum."

The FCC has called for final comments on its proposals by June 6 this year.

Nokia, Ericsson Corner GSM Market

Scandinavian companies Nokia and Ericsson continue to battle it out for dominance in the world GSM market with each recording recent international sales successes.

In Sweden, Nokia has won a new contract worth $US50 million to supply GSM base stations to mobile operator NordicTel, while in the Philippines the company has won a $US30 million order from Globe Telecom to supply the first GSM network in that country.

NordicTel is one of three GSM operators in Sweden and is owned by Pactel, Vodafone and Swedish companies Volvo, Trelleborg and Spectra Physics. Globe Telecom is owned by Philippines conglomerate, Ayala and Singapore Telecom International. Its licence calls for 100% coverage of major cities within seven years.

Ericsson's recent successes in South Africa and Thailand extends to 25 the number of countries to select its GSM products.

Mixed Results For AT&T, MCI

Rival US long-distance carriers MCI and AT&T have recorded markedly different 1993 results.

Continuing to grow in leaps and bounds, MCI boosted its revenues by 13% to $US11.9 billion during 1993, while posting a 4.4% drop in net income to $US582 million after a one-time charge of $US45 million to account for debt retirement and tax law changes. Excluding abnormal items, the company recorded full year earnings of $US731 million, or $US1.30 per share compared to $US1.11 per share in 1992. The result means that MCI has doubled its revenues in only five years.

It was a different story over at AT&T, where the giant company reported a loss of $US3.79 billion following its $US3.8 billion 1992 loss. However, AT&T says it would have posted a healthy profit if a $US7 billion charge to comply with new accounting rules had not been applied. The company's revenues grew by 3% to reach $US67.2 billion.

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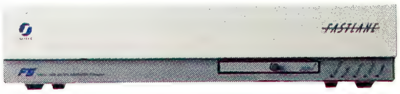

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Words At Work Net 054

PMT — Waiting For an Opportunity

Unfazed by missing out on a satellite Pay TV licence, the Packer-Murdoch-Telecom consortium is considering its options.

With great stealth and determination, the Packer-Murdoch-Telecom (PMT) consortium is now making the kinds of strategic behind-the-scenes moves that will ensure it emerges as the dominant force in the Australian Pay TV industry well before the end of the decade.

Largely out of the limelight since underbidding for, and ultimately losing, the only licence the Government allowed it to have a crack at — Licence B — PMT has hardly been sitting in a corner sulking. Rather, it has drawn on its awesome array of pooled talents to assess the merits of the various options open to it. These include:

- Buying into the Australis-Lenfest group, which eventually paid $117 million (of an original bid of $220 million) for the 4-channel Licence B, or alternatively, buying the group outright;
- Leasing satellite time from Australis until 1997, when all restrictions will be lifted;
- Leasing satellite time from the ABC, which has been awarded the 2-channel C Licence;
- Leasing satellite time from the holder of the A Licence, currently UCOM, whose application is currently before the Australian Broadcasting Authority, having been cleared earlier by the Trade practices Commission (UCOM will have to pay $77 million if it is approved, most probably in some arrangement with United States cable company Century Communications and Continental Venture Capital);
- Buying Multipoint Microwave Distribution Systems (MDS) licences from the Government and/or Australis and other parties;
- Using cable to the home, either fibre optic, or the twisted pair copper or coaxial wire employing asymmetric digital subscriber loop/line (ADSL) technology, which Telecom is already examining;
- A combination of all of the above.

While *Australian Communications* understands PMT has put out feelers to both Australis and the ABC's Pay TV division, recent analysis by stockbrokers McIntosh outlines five different scenarios for the future of Pay TV in Australia, exploring the various options available to Australian Pay Television, the working vehicle for the PMT interests.

The document was compiled by media analyst Viktor Shvets and partner David Kelly, who at the time of writing were waiting for responses from the five members of PMT before releasing further details.

However, Shvets said the report largely concentrated on PMT and B Licence holder, Australis, and the various permutations and combinations of relationships which the two groups might enter. The analysts also examined the overall viability of Pay TV in Australia, the size of the market and how each option might impact on the financial results of the companies involved.

Who's Who in PMT

A breakdown of PMT's equity base shows Telecom parent, Telstra Corporation, and The Nine Network with just over 28% each; News Corporation, the parent of News Ltd, with 18%; Channel Seven with 15%; and Channel 10 with 10%.

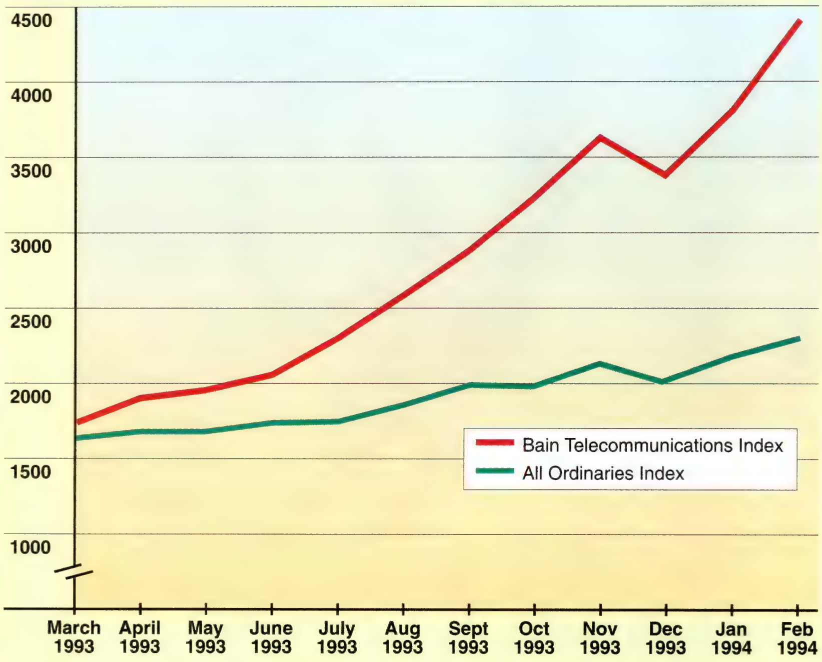
But despite the enormous public profiles of all the individual partners, PMT remains a somewhat shadowy entity outside the communications sector. Its nominal operating vehicle, Australian Pay Television (but "The name is not important," a PMT insider said), does not have a secretariat of any kind or any office space.

What PMT does have is access to an almost bottomless pit of investment funds, as much programming material as any operator could hope for, and all the infrastructure, technical skills and staff needed to operate a network. A major potential resource for PMT is Rupert Murdoch's Fox Network in the US and its vast library of movies. Murdoch's interests in Britain's Sky-B-Sky and his 63.6% stake in Star TV based in Hong Kong represent further sources of programming material as well as export outlets for Australian programmes.

The Nine Network owns Australia's Sky Channel and has plans for the old Topaz studios near Darwin which can beam into Indonesia. Between them, The Nine Network, Channel 7 and Channel 10 can easily provide copious quantities of news and sports TV programmes, which, along with movies, have proved to be the staples of Pay TV around the world.

Access to such resources would appear to dovetail with the plans of the ABC, whose broadcasts will consist mainly of children's daytime programmes, evening documentaries and cultural programmes as

Stock Watch



The Bain Telecommunications Index (BTI) includes only those public companies which derive the majority of their earnings from the telecommunications sector. It is calculated in the same fashion as the All Ordinaries Index and is maintained by the Australian Stock Exchange Index Office. The formula is:

$$\text{Today's Closing BTI} = \text{Yesterday's Closing BTI} \times \frac{\text{End of Day AMV}}{\text{Start of Day AMV}}$$

where AMV refers to Aggregate Market Value - i.e. total market capitalisation. The start of day AMV is the previous day's end of day AMV and is adjusted for any changes in the BTI such as additions, capital reconstructions, rights issues etc. This ensures that any movements in the BTI are the result of trading activity in that day only.

Company	Market Capitalisation $M	Performance %	Share Price ($) 1/2/94	Share Price ($) 52 Week High	Share Price ($) 52 Week Low
AWA	179.2	22.2	0.88	0.92	0.59
Datacraft*	70.8	636.4	0.70	0.82	0.10
ERG Australia	416.8	185.3	3.30	3.70	1.02
Exicom	148.8	206.8	1.35	1.40	0.41
JNA Telecommunications	100.4	141.4	3.38	3.40	1.40
Matrix Telecommunications*	156.9	489.1	3.24	3.65	0.52
NetComm	11.5	N/A	1.25	1.40	1.12
Scitec*	22.6	522.2	0.28	0.30	0.04
Stanilite Pacific	184.9	139.3	6.30	6.70	2.49
Techniche	97.8	281.0	5.05	5.25	0.82

**Not currently in the All Ordinaries Index*

Market capitalisation is the share price multiplied by total ordinary shares on issue.
Performance is the percentage share price movement over the past 12 months.

Source: Bain & Company

well as Australian drama and comedy. ABC Pay TV General Manager, Kim Williams, says: "All the Pay TV services must be in harmony and concert with each other. We are all interdependent. Sports, news and movies must be in the right mix to attract an audience. These are the systems drivers, whereas our programmes can be seen as system sustainers."

While it bides its time before making its next move, PMT has the benefit of the expertise of five highly experienced representatives from each of the consortium partners. These are Nick Falloon, Finance Director of The Nine Network, controlled by Kerry Packer; Malcolm Collis, General Manager of Corporate Development at News Ltd, controlled by Rupert Murdoch; Harvey Parker, Group General Manager, Consumer and Commercial at Telecom; Sean O'Halloran, Broadcasting Policy Director of Channel 7; and Peter Viner, Chief Executive Officer of Channel 10.

The chairmanship is rotated annually and the incumbent is Malcolm Collis, who took over from former Nine Network Business Development executive, Lynton Taylor, who has gone out on his own but still consults for Nine.

The group is in constant telephone contact and meets regularly to discuss everything from government policy to emerging technologies, the latest state of play with the A and B Licencees, the forthcoming auctioning of additional MDS licences and developments in cable TV overseas. And because of the enormous media interests involved, the group has access to vast quantities of research material from around the world. "If a particular issue emerges and we need to examine it more closely, we'll form a committee made up of the people who have the most expertise in that field," a PMT source said.

A Cable Future?

No doubt the group will take a keen interest in the proceedings of the Broadband Services Expert Group which over the next few months will examine what 'information superhighway' services Australians should have access to, and how access should be provided.

Headed by the chairman of the Australian Broadcasting Authority, Brian Johns, the group will investigate the full range of broadband services, ranging from multichannel cable television, interactive TV and high definition television, to electronic newspapers and high-speed data transfer to and from homes, businesses and educational institutions.

While a PMT source rejected media reports that the group had tried to 'stack' the broadband hearings by promoting former NSW Labor Premier Neville Wran as chairman, the PMT interests will be well represented by Executive Chairman of The Nine Network together with longtime Packer stalwart, Bruce Gyngell. The broadband group is expected to submit a draft report to Government by mid-year, with a final report due by the end of the year.

The PMT source agreed there "may be some nerves in Canberra" about a further concentration of media ownership in Australia. "But don't forget the Government deliberately limited our options by cutting

Continued on page 23

The NSW Bushfires

Fire Fighters Hampered by Radio Incompatibilities

If they can be said to have done any good at all, the bushfires that ravaged NSW early in the New Year have served to expose some potentially disastrous gaps in the communications links among Australia's multiple emergency service agencies. Solutions exist in theory, but it's anyone's guess when commonality will prevail nationally.

The problem was not a lack of available radio frequency bandwidth: it was a lack of compatibility. This led to a situation where professional firemen, volunteer fire fighters, police, emergency services and other groups, including volunteers from other States, were forced to communicate with each other via a haphazard, makeshift network patched together to meet the crisis on an almost moment-to-moment basis.

At the height of the blazes, Telecom's NSW Government account team threw as much goodwill, time, human resources and as many mobile handsets and base stations into the fray as it could muster. But this did not prevent some enforced choking of the mobile network in crisis areas for the benefit of emergency workers, nor the destruction of at least 46km of overhead cable in Sydney and the Blue Mountains, which cut off many hundreds of premises. A sampling of country figures show 1,061 customers affected at Gosford; 874 at Newcastle; and 486 in Maitland. No record was kept for the metropolitan area: staff were too flat-out with the task at hand to be concerned with statistics.

Telecom had one of the clearest pictures of the movement of the fires from computer screens at its Network Management Centres in Sydney and Melbourne, which monitored the flow of traffic in and out of fire-stricken areas. Most of those directly involved in fighting the fires praised the national carrier for boosting the tenuous emergency communications systems by providing mobiles and base stations, and for its generous contributions of time and labour. Then there was the $100,000 donation to the Sydney Lord Mayor's Emergency Relief Fund.

While the NSW Fire Brigade has a fairly sophisticated network with 12 VHF channels operating around 78KHz, the NSW Bush Fire Service, a largely voluntary organisation of some 70,000 people Statewide, with a core full-time administration of some 140-150, employs a combination of different technologies, from VHF and UHF trunked mobile radio to CB radio, which are generally not compatible with the Fire Brigade network.

Add to this the lack of radio compatibility with the dozens of interstate teams that poured in to help quell the inferno, and the situation becomes even clearer. Even the head of the NSW Fire Brigade, Stan Hearn, was forced to publicly admit that lack of compatibility with the interstate volunteers had delayed their entry into the battle.

In the event, the temporary head of the Spectrum Management Agency's (SMA) Sydney regional office was forced to play a game of electronic ping-pong, fielding requests from the NSW Government's Telecommunications Unit and other coordinators to clear certain frequencies. In almost all circumstances, the requests were granted for the greater good.

SMA data on the emergency frequencies in use across the nation demonstrate how complex and confusing interconnection can be. There are 60 licences in the high frequency band up to 30MHz; 240 in the VHF mid-band between 70-85 MHz; 150 in VHF high-band between 148-174MHz; and 380 in the UHF band above 400MHz. "There are no VHF channels nationally available for fire fighting. There's a bit of commonality, especially in Queensland, but this is not the norm," according to the SMA's Technical Services Team Manager, Peter Stackpole.

NSW Fire Brigade's Senior Communications Officer, John Shenstone said: "Put simply, the States don't utilise the same UHF and VHF frequencies. The problem was the same wherever there were interstate teams, in that they were unable to communicate by radio with the coordination points. The only exceptions were the Queensland teams which re-programmed their radios to one of the 12 NSW frequencies."

Ray Kelly, the Brigade's Technical Operations Manager, believes parochialism and "empire building" are largely to blame and a Federal solution may be the answer. "If the Federal Government were to consider that solution, we would all be able to talk to each other. But it's just like all the different railway gauges; not much has changed since the early days of train transport."

But the solution may not be as simple as putting all States on the same frequencies, according to Shenstone: "My feeling is that the answer may be gateways which would allow access to the different networks while giving the various States the sort of local flexibility they need."

Waiting For the GRN

Had the tinderbox of forest fuel that had collected around the State not exploded for another year or more, the emergency services would have had access to the new

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Network General

NSW Government Radio Network (GRN), a new integrated, digitally-capable trunked mobile radio system designed to link all government departments. Implementation begins next month, with the backbone covering the high-density urban areas of Sydney, Wollongong and Newcastle. Corridors into country areas like Queanbeyan, Orange and Scone should be in place by the end of the year.

Six years in the developing, with input from police, emergency services, fire fighters, the ambulance, the Roads and Traffic Authority, the Water Board and Forestry among many others, the GRN is being built by Telecom and Motorola, based on Motorola's SmartZone technology. The GRN will replace 30 existing networks requiring 200 base stations with a single network that needs less than 40 base stations. Telecom and Motorola are committed to spending at least $27 million on the project, which will be headquartered at a control centre in Sydney's Goulburn Street, not far from Police Headquarters. The GRN will also interface with the NSW Government private network, being built by BT Australasia.

But Technical Services Manager with the NSW Department of Bush Fire Services, Peter Easy, said his main concern with the GRN was whether it would provide Statewide coverage beyond the high-density areas around Sydney. "It probably will be extended into outlying areas but this will be some years down the track and in the meantime, we will have to continue to provide a dedicated system for our people."

Easy revealed that for this purpose, the Bush Fire Service was now trying to rationalise its network into a single band and provide standardised communications equipment and procedures through NSW.

Bernard Levy

PMT from page 20

us out of the bidding for the A Licence. The aim was to allow a new player to break into this medium and they have achieved this. Australis is now listed on the Australian Stock Exchange and is a real player.

"Also, we didn't think the B Licence was worth the $200-odd million the others bid, so to some degree we also helped cut ourselves out. It was fairly clever tactics on their part in the end because the B Licence eventually went for just $117 million. But my view is that because of the relatively small size of the Australian market, no matter how the service is delivered, it's very likely that within five to ten years there'll be one major player in the game, and that will be PMT. Of course, there will be lots of smaller players, but they will hang off our operations."

Media analyst Peter Cox said PMT was currently reassessing future directions both as a group, and as individual partners.

"They could buy up MDS licences or get into a mixture of satellite, cable, MDS or ADSL. But remember they only have contractual obligations to each other for a certain amount of time, and each company has a history of aggressively pursuing its own business interests. In the short term, Pay TV will be exceptionally expensive because of the limited income it will offer."

Cox said a big worry for Telecom was the potential threat from independent cable TV operators in a fully deregulated market. "By laying fibre optic cable to homes, Telecom could be helping to develop rival telephony services," he said. "Broadband cable can deliver telephony, video, data and all the other services. But the puzzle in the US, for example, is that telephone services can also be provided by cable network companies. In Australia after 1997, cable companies could provide competing telephone services to Telecom, whose battle is all about control in the future," he said.

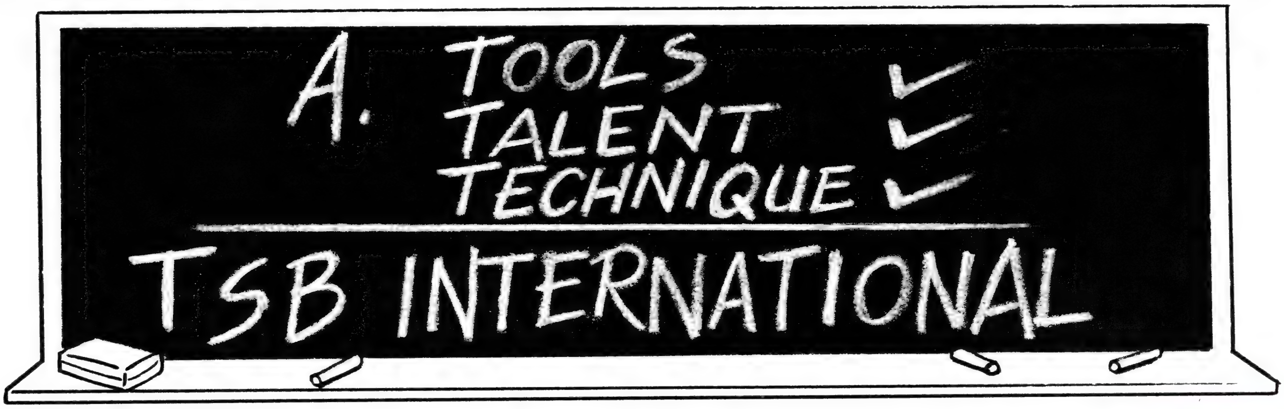
Analyst with Hambros Telecommunications, Dr Chris Beare, said there was not a lot of room in Australia for many large players and anyone in Pay TV would have to figure on a major PMT presence some time down the track.

Beare said the auctioning of the remaining MDS licences around Australia may represent an opportunity for PMT, but that Australis had already bought 13 licences in each of the major markets of Sydney and Melbourne. There were just six remaining licences in each of those cities, whereas there were 17 in Adelaide, 15 in Brisbane, 14 in Perth, 18 in Cairns, 18 in Darwin, 16 in Canberra and 18 in Hobart. After the capital cities, the most valuable remaining licences were considered to be those in Alice Springs, the Gold Coast, Cairns, Newcastle and Wollongong.

Senator Richard Alston, the Opposition Communications spokesman, said he could not discount the notion that PMT would ultimately become the largest player in Australian Pay TV. Questioned on a further consolidation of media ownership, Alston said: "There's a lot to be said for existing players being able to migrate to other technologies. But they should not be able to stitch up the market to the point where they block competition. The Coalition would work for an ordered and balanced approach."

Alston said the Opposition had always been keen on "technological neutrality" and where there were "cumbersome" restrictions on satellite Pay TV, and virtually none on cable, he would like to see a "sensible rationalisation and mix."

Bernard Levy



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Micro-Satellites

Big Plans to Join the Little LEO Business

The race to offer communications services from micro-satellites has hotted up with the announcement of a new competitor — a Queensland businessman who has proposed a store-and-forward satellite system. James Kennett, 36, the proprietor of a security and monitoring company on the Gold Coast called Kennett International Technologies (KIT), has announced plans to fly a nine-satellite constellation of micro-satellites. The satellites will be used to reticulate signals from sensors located anywhere on Earth back to a monitoring station. Mr Kennett has formed a company called Kitcomm, located in Southport, Queensland, to build and operate the constellation.

While operators of communications satellites in the geostationary orbit (around 32,000km) scramble to soak-up unsatisfied demand, particularly in the Asia-Pacific region, at least nine corporations around the world are attempting to use low earth orbit (LEO) satellites to offer a whole raft of new data and mobile communications services at extremely attractive prices. LEO is generally considered to be about 1,000km high.

Most publicity has been given to companies who want to establish worldwide LEO voice communications systems. These so-called 'big LEOs' include Motorola Satellite Communications, TRW, Loral Qualcomm Satellite Systems, Ellipsat and Constellation Communications. In general, the systems proposed by these companies are designed to interconnect into the PSTN anywhere on Earth. They involve large numbers of satellites, have extremely complex switching technologies and enormous price tags. Motorola recently estimated a price of about $2 billion for its Iridium system. The price of handsets to consumers will probably be an order of magnitude greater than existing terrestrial mobile handsets.

However, below these system is another tier of endeavour, the little LEOs, which will offer low bit-rate data only, non-continuous coverage and be very much cheaper.

There are several contenders: Taos, Orbcomm, Starsys and now Kitcomm. Orbcomm is owned by Orbital Sciences Corporation of the US. Starsys is owned by North American Collection and Location and Hughes Space and Missiles. North American, in turn, is owned by CLS Argos of Toulouse, France. CNES, the French Space Agency, owns part of CLS. CNES is also a major shareholder of the Taos system.

While the big LEOs will use satellites of less than 1,000kg (a typical geostationary satellite weights more than 2 tonnes), these little LEOs weigh in the 50-100kg range.

Engineering detail on all the big and little LEOs is still sketchy. Frequencies were only allocated to LEO in March 1993 by the World Administrative Radio Conference. Under WARC regulations, little LEOs may operate in the following bands: 137-138, 148-149.9, 149.9-150.05, and 400.15-401-MHz. However, operating rules for sharing the spectrum space were not ironed out. In the policy vacuum, the FCC has defined rules for US operators (and hence worldwide). These were released in late 1993.

Typically, Starsys publicity says it will be using 149.9MHz for its uplink, and 400.15MHz for its downlink. It will use QPSK as the modulation method in both directions, and achieve a bit rate of 28,000 bits per second. There will be 24 satellites, parked in orbits 1,300km high. (But this should not be taken too seriously: like all the others, Starsys is still in the design stage. For instance, Starsys shares some common shareholding with the French Taos system, and there has been some speculation that Taos and Starsys may join.

The prototype satellite of the Taos system is the S80T satellite. This was built by Matra-Marconi, the University of Surrey and Dassault Electronique. It was launched by Ariane rocket on 10 August 1992, and is still being used for experimentation. It has an uplink at 148-149.9Mhz, a downlink at 137-138Mhz, and a single 25 Watt transponder. It is designed to communicate with ground stations via a standard UHF TV antenna. Interestingly, S80T payload (the repeater and antenna) weights just 7kg.

S80T is not the only experimental satellite in space either. CLS has been flying the Argos experimental science and positioning satellite for several years. Orbcomm launched a Capabilities Demonstration Satellite on a Pegasus rocket in February 1993.

However, it is generally supposed that the technical problems facing the little LEOs can be solved. The real determinant of success or failure will be financial. So far, none of the groups has announced the unambiguous success of funding drives.

In this light, the activities of Kitcomm assume special significance. In December, US rocket maker PacAstro announced it had signed a contract with Kitcomm for the flight of two of its Swedish-designed PA-2 rockets, to carry the nine satellites of the constellation. KIT put up $4 million — the rest of the launch fee is to be exchanged as equity. PacAstro is a joint venture of Sumitomo of Japan, the Swedish Space Corporation and AeroAstro. Sumitomo will market the launch service in Asia.

Remote Monitoring the Driver

James Kennett's prime business is the provision of security and monitoring information. Typically, information from sensors in the field is bought back to a central control station. His bread and butter is in supplying security systems in office blocks and the like. Recently, however, he has been supplying systems to monitor extremely distributed systems, like oil pipelines, conveyer belts, electricity grids and the like. These systems may stretch over many kilometres, and clearly there is a cost associated with sending the information back to a central control point.

He would also like to monitor isolated equipment like rain gauges or thermometers in the middle of the desert, river level indicators in remote corners of the world and so on. The data flow from such sensors is typically small, maybe just an indication of valve position, pressure value or some other simple value. It never requires anything as complex as imagery, hence even a simple two-wire communications system represents considerable excess communications bandwidth.

He has convinced himself that considerable economies can be achieved by using a simple satellite configuration to replace the wiring. Under his scheme, data from the sensor is received on the satellite and stored in on-board memory. It is then downloaded over the control centre in Darwin.

Under Mr Kennett's plan, the company will make money by leasing the sensors to his clients. He says the standalone devices will cost about $5 per week. There might be a market for about 100,000 of these devices in Australia. The market worldwide would be measured in the millions.

The cost of the satellites is about $5 million each. Mr Kennett says that to create the total constellation will probably cost about $55 million. This puts him in a very strong position. Unlike other LEO proponents, Kennett does not have to create a market for his service, with all the risks in time and money that entails. Rather, the activities of Kitcomm will simply be an extension of his existing business.

This is also reflected in the system architecture. Because the system is being designed to solve a specific business problem, it has few of the complexities that make competing systems more expensive. Each satellite will weigh about 50kg, and "be about the size of a personal computer, but round," says Mr Kennett. It will not be stabilised. Power of a few watts will be supplied by solar cells and a small back-up battery. There will be just one transponder on board. Many of the other details, such as the modulation scheme and power output, still need clarification. Many of these questions will be resolved by tests currently under way on S80T.

In October, the Australian Space Council approved funding for Auspace Ltd of Canberra to carry out noise propagation experiments on board the satellite, under the auspices of the French-Australia Science Program. Sources in the Australian Space Office, which administers the funds, say

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this was not done at the behest of Kitcomm, but that there is interest in the radio noise environment over Australia as a general precursor to work on small satellites.

Paul Arthur, the engineer in charge of the project in Auspace's Adelaide office, refused to comment on the technical details of his experiments pending the signing of contracts with the ASO.

Whatever the business and technical issues involved, Mr Kennett will also need to confront the communications regulations. On the surface at least, Kitcomm will be a communications carrier within the meaning of the *Telecommunications Act*, so it will be prohibited from operating until July 1997 at least. However, in a written response from the Department of Communications to questions from *Australian Communications*, the department notes there 'is some flexibility' in the rules. For instance, the Departmental response notes that the Minister for Communications may direct Austel to authorise the use of certain facilities. He must first consult each carrier if he foresees that their interests may be affected.

Strong Industry Interest

Kennett's scheme has aroused strong interest in the Australian space industry. It has become public knowledge just as the newly-formed Australian Space Council is putting together a five year plan for the industry. There have been many suggestions over the years that small or micro-satellite construction was a natural path for Australian industrial development; however, there has been little enthusiasm within government for directly funding such a project.

With the creation of a commercially driven project, however, things have changed considerably. Each Kitcomm satellite will last about five years. This implies a continuing market for one or two satellites a year at about $5 million each. Beyond that, the existence of an indigenous satellite manufacturing capability, albeit small, could have far reaching implications for the communications industry in general.

Several organisations are known to be keen to tender, including the Signals Processing Research Institute (SPRI) in Adelaide. Mike Miller from SPRI says the satellites are small enough to be made in a laboratory and could be produced by his organisation with very little extra investment in plant and equipment.

However, there does appear to be at least one lever at the Government's disposal.

Getting the satellites into space is a separate business, in which Kennett also has an interest. The KIT/PacAstro conglomerate is interested in a launch site near Darwin, and officials from the investor companies inspected sites in the region in January.

Several space industry sources have speculated that one inducement the Australian Government might be able to provide would be to offer the Darwin launch facility to the joint venture under some favourable arrangement. It is likely however, that any such offer would be part of the Australian Space Council's five year space plan. This plan will be part of the Federal Government's industry statement, currently slated for May.

One fly in the ointment is that the funding of PacAstro is not yet complete. According to a report in the US industry journal *Space News* in December, PacAstro had a backlog of launch orders worth $US10 million. This includes a flight for the Swedish Space Corporation and another unnamed customer in addition to the Kitcomm business. But total start-up costs of the company will be about $US26 million, according to a statement to *Space News* by Rick Fleeter, PacAstro's chief executive. Fleeter also says that PacAstro will be able to offer flights for about $6 million from a Darwin facility and that the PA-2 rocket will be able to carry about 230kg into low earth orbit.

Jon Fairall

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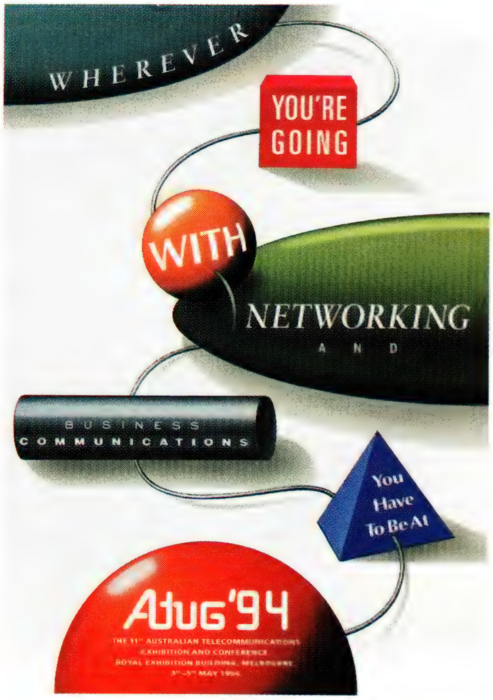
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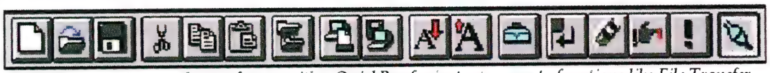

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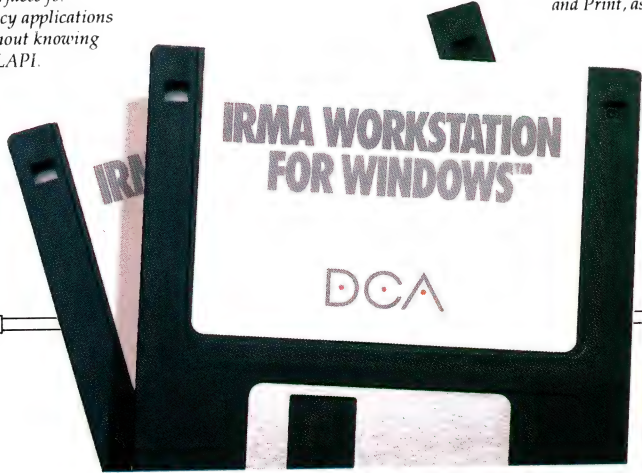

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MATRIX D774

The Intelligent Network

A Fax Service With a Distinct Ring to It

Australia is about to get its first trial of a new telephone signalling system that has been widely used around the world for quite a few years; it goes under the generic name 'Distinct Ring' and is lumbered with a number of brand names like 'Ring-Chek' and 'Ident-a-ring.' Telecom is planning Melbourne and Sydney trials of Distinct Ring this month as part of its Homefax project.

Homefax, as the name implies, is designed for domestic and small business applications where a single analogue line is required to carry both fax and voice information. It is an alternative to using a fax-switch which picks up the incoming call, listens for the 2100Hz modem identification tone, and then switches between a ring generator for the phone or the direct feed to the fax.

Homefax relies on two phone numbers — one for the phone and one for the fax. When the fax number is received in the exchange it generates a distinctive ring-tone cycle, and this can be interpreted by the appropriate CPE and used to trigger a switch. From the outside, it appears as if you have two lines, each with its own number.

There are a number of quite different ways in which Distinct Ring can be implemented by the carrier; some give the service a wide area of application, and some are more specific. Telecom has currently chosen a more specific path; it has been negotiating with fax importers and fax-card makers in Australia to include in their products the ability to detect the Distinct Ring cadence (three short 200ms bursts separated by 400ms breaks).

As part of the service, the software identified with your Homefax line will also switch off any 'intrusive' tones, such as those generated as part of the CLASS Call Waiting feature. Fax systems don't like intrusive 'alert' tones in the middle of a transmission. When you wish to send a fax, you can also pre-select the fax-line (by prefixing the calling number with *11*3) as you dial-out, and this dial-sequence will then also initiate the blocking of Call Waiting tones. What's more, when you use this prefix, the fax call will be billed against the fax number rather than to the normal voice number. You will get two monthly bills for the same line.

The distinctive cadences used in this service aren't part of any international standard, so Telecom is currently relying on fax importers and fax-card makers to implement the Australian tone sequence detection in new machines. Most changes, they say, can be made in software, and store-bought machines can be set up to detect the 3-ring sequence, with the normal 2-ring cycle also available as fall-back for those of us who use a home fax on a normal phone line

In America, the emphasis has been placed more on using small Radio Shack switcher boxes (costing $US75) which provide the ring detection, and switch between either of two outputs. These don't require modifications to be made to the fax or fax-card software. AT&T also makes a similar device, with a further physical switch on the box to allow you to toggle the fax-line between a PC and a standalone fax.

One advantage of the separate switch box is that it blocks the use of the phone and extensions (some generate a fake busy tone) so that you can't inadvertently interrupt a fax conversation. The Australian approach (with modified fax machines) won't do this, since both the fax and handset/extensions are all swinging off the same line.

Telecom says that it is looking at a figure of about $60 a year for the Homefax service, which is probably reasonable, given that it effectively replaces the rental of a phone line. In the US, distinctive ringing costs between $US3 and $US6 a month depending on the carrier.

Signature Rings

In the States, there's also a service called 'Priority Ring' which provides a distinctive ring-sequence when someone on your personal list calls you. You establish a list of 'priority callers' in the phone company's exchange computer, and this is then linked to your phone number. With Priority Ring you can identify those calls that you want to answer, and those that you think you can ignore. It bases the ring-sequence selection on the Caller Line ID.

Bell Canada is also trialling a system called 'LD Signal' which provides a specific cadence for incoming long distance calls. The specific ring-sequence is also translated into a matching pattern on Call Waiting tone alert; in fact, it does this even if the customer does not subscribe to Call Waiting. If the call isn't answered within 25 seconds, the caller will receive a network announcement indicating the line is busy, followed by a standard busy tone.

When will we get all these features? Well, Telecom isn't saying. However the new AXE and System 12 exchanges have all been equipped to handle a number of distinctive dialling tones — you can have four numbers and tone patterns if you have an analogue line, and eight if you have Basic Rate ISDN. When you buy a BRA ISDN connection, they will automatically reserve eight consecutive numbers for your use. Telecom designates these eight cadences as DR0 to DR7, with DR0 being the normal telephone ring sequence we know and love, and DR7 being the new 3-times 200ms-400ms sequence. The others are currently in reserve.

Stewart Fist

Mobiles

New Antenna Reduces Radiation

A mobile handset antenna claimed to significantly reduce the amount of microwave energy absorbed by the human head has attracted the interest of Telecom Research Laboratories (TRL), which has been trying to develop a similar device.

Produced by the Radio Science Laboratory of the School of Microelectronic Engineering at Griffith University south of Brisbane, the new antenna can be electronically steered and its inventors say this, along with some other features, reduces the amount of energy absorbed by the skull by a factor of two-to-one. The unit is based on 1970s technology for large antennas which had not been applied commercially.

Inspired by cancer law suits against mobiles manufacturers in the US last year and exhaustive reports on cancer risks in the IEEE magazine, *Spectrum*, the inventors say the unit has been designed as a drop-in replacement for existing antennas and is suitable for analogue and digital phones. Apart from cost, the only difference between current replacement models, at $40-$60, and the new device, at under $200, is the connection screw on the base of the unit.

Director of the Griffith University Radio Science Laboratory and head of the antenna research team, Dr David Thiel, said secondary benefits of the device were that it improved cellular phone performance and lengthened battery life. "If 43% of the energy transmitted by a handset is absorbed by the head, any minimisation of that absorption via a steerable antenna means you have immediately increased the radiated signal from the handset. This in turn means the transmitter doesn't have to wind itself up so high and so draws less power from the battery."

Apart from conceding that his team was having trouble gaining access to certain materials such as protective and reflective coatings, Thiel refused to divulge any technical details of the unit, saying his hands were tied until final patents for Australia, the US and Japan were lodged in May.

Section Manager of TRL's Electromagnetic Compatibility unit, Ken Joyner, confirmed he was interested in talking with the Griffith University team. Joyner said one of his team was working on a similar idea, but it appeared that while the TRL model involved a fairly major redesign of existing antennas and handsets, the Griffith University device was an easy replacement.

"It sounds very promising. My only concern is that their conclusions are based on calculations alone. We would need to have some independent testing done," he said.

Bernard Levy

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Telecommunications Development

The ITU Still Hopes For a Miracle

"(The International Telecommunications Union) has had difficulty in making a real impact in initiatives to close the 'telecommunications gap' between developed and developing countries, particularly the least developed countries. Frustration over the slowness of demonstrable results has manifested itself at successive ITU plenipotentiary conferences and unless a miracle happens at the world telecommunications development conference in Buenos Aires in March 1994, the next regular plenipotentiary conference in Kyoto in September 1994 will be no exception."

That rather gloomy prediction was made by Gabriel Warren, former chairman of the High Level Committee (HLC) which the ITU established at its 1989 plenipotentiary to make recommendations on a radical restructuring of the ITU to create an organisation more appropriate to the telecommunications environment of the late 20th century. Warren was speaking at the annual conference of the Pacific Telecommunications Council (PTC'94) held in Honolulu in January.

The restructuring recommended by the HLC saw the ITU re-organised into three sectors: Standardisation, Radiocommunication and Development, reflecting its key roles. The development role has been the least successful for the ITU in the past. The formation of the new sector, and the upcoming World Telecommunications Development Conference (WTDC '94) to be held in Buenos Aires from March 21-29 represent the ITU's latest attempt to get things right.

WTDC '94 comes just 10 years after the publication of a seminal report, from the Independent Commission for Worldwide Telecommunications Development, which has shaped the ITU's approach to development of telecommunications since that time. Titled *The Missing Link*, the report examined the huge difference between telephone accessibility in the developed and underdeveloped world and said that 'Neither in the name of common humanity nor on grounds of common interest is such a disparity acceptable.'

Its overriding recommendation, taken up by the ITU, was that 'by the early part of the next century virtually the whole of mankind should be brought within easy reach of a telephone.'

WTDC '94 will be the culmination of a series of regional development conferences which the ITU has organised since the 1989 Plenipotentiary (these have covered Africa, Asia, Europe, the Americas and the Arab States). It will set the agenda for the ITU's development efforts and, in particular, for the Development Bureau, probably for the rest of this decade.

Contradictory Signs

A key component of the WTDC '94 discussions will be the ITU's World Telecommunications Development Report, perhaps the most comprehensive study ever made of the state of telecommunications throughout the world.

The full report will be available for purchase from the ITU only after the start of the conference, but already snippets are emerging, both from a paper given by one of the report's principle authors, Michael Minges, at the IIR Pan-Asian Telecommunications Summit in Bangkok last December and from ITU Secretary General Pekka Tarjanne at PTC '94. Perhaps the most telling shows how little progress there has been toward achieving *The Missing Link's* goals. In the figure below, a straight line represents the ideal of equal distribution of telephones throughout the world, one distant curve the true 1983 distribution, and another curve, almost so close as to be identical, the actual 1992 distribution.

The gap is narrowing at a much slower rate than hoped, according to Tarjanne, but he pointed out the graph measures only 'quantitative' changes in the distribution of basic telephone services and 'qualitatively' the gap is increasing. "There is some evidence to show that the gap has widened in some areas, notably in the provision of advanced telecommunications services."

However, Tarjanne and Minges saw in the findings of the World Telecommunications Development Report evidence for rather more optimism for telecommunications development than Warren seemed to.

"One of the most encouraging trends in (the Asia Pacific) region is the fact that transition from a high to a low teledensity (from 10 to 30 lines per inhabitant) is apparently becoming easier and quicker over time. The first country in the region to achieve this was New Zealand, but it took 35 years (1938-73) to do so. As of the early 1990s six other economies in the region have made the transition and others will follow suit shortly."

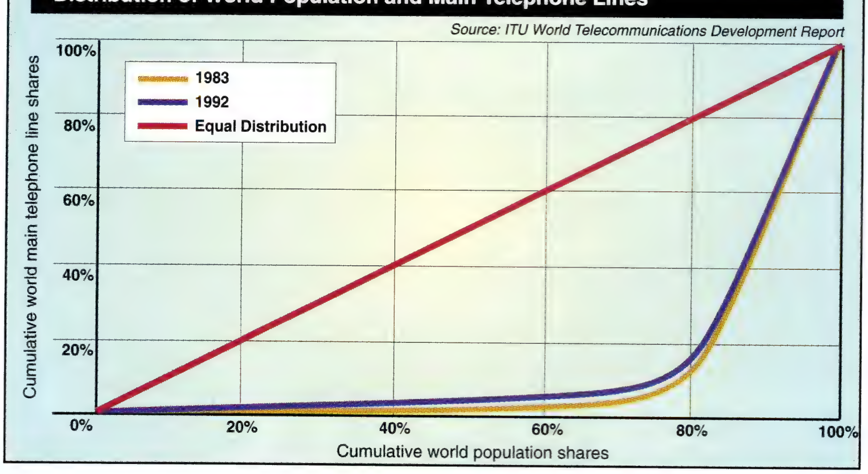
In fact several countries in the region are claiming plans to increase their teledensities at rates well in excess of those predicted in the Development Report. The Philippines, for example, plans to add 2.9 million new lines between now and 2000, more than 10 times the figure predicted by the ITU. To achieve this the Government has opened its network market to private investment and has made as a condition of entry into the lucrative cellular and international gateway businesses the provision of a minimum of 400,000 lines of basic network by cellular operators and 300,000 by international gateway operators. For this purpose it has split the country into regions to ensure that each operator installs their lines in both metropolitan and rural areas.

The ITU may gain another weapon in its fight to develop telecommunications. There is a proposal to establish Worldtel, a commercially run world funding and development organisation for telecommunications which would seek to attract investment capital for telecommunications development projects. The Worldtel idea grew only indirectly out of Warren's High Level Committee, which concluded that 'there does not seem to be enough support at present to convince us that a proposal to establish an international investment agency devoted to telecommunications development would be viable.' But it did recommend creation of a World Telecommunications Advisory Council which set up a working group to examine the feasibility of Worldtel. In November last year the Advisory Committee made a recommendation to the Secretary General that a full feasibility study for Worldtel be conducted, funded by voluntary contributions.

Stuart Corner is Editor of Exchange.

Distribution of World Population and Main Telephone Lines

Source: ITU World Telecommunications Development Report



Canada

The Case of the Spinning Satellites

On January 20th, Anik E-1, one of Canada's main telecommunications satellites, suddenly spun out of control, cutting long distance phone links to the remote parts of northern Canada and destroying newspaper, radio and television station feeds.

The disruption happened at 12:40pm during a lunch break, and about 3,000 Canadian corporations had their communications disrupted. Telesat Canada, the owner of the satellite, says that service to most customers was restored by backup stabilisers by about 8pm.

But a hour later, at 9.10pm, their second satellite, the Anik E-2 also did a cartwheel and knocked out the national television network, CBC and a few cable channels.

Telesat Canada is still, at the time of writing, trying to get E-2 back under control. It is spinning twice a minute, and neither the primary or the backup stabilising system is functioning. Some preliminary computer simulations suggest that they may be able to get it back under control in about six months, if they are lucky.

Fortunately Telesat was able to back-up the television feeds over cable, and they managed some quick hiring of American transponders. But it took quite a few days to restore links to some centres across Canada, and the Canadians are now having second thoughts about satellite reliability. Company spokesman, Chris Frank, says that the company might have to issue rebates to the tune of "hundreds of thousands of dollars." He says that these twin disruptions are "a blow to us in terms of our credibility, but we're working hard to mitigate it."

A Wobbly Explanation

So what could possibly cause two domestic satellites to suddenly go haywire on the same day, but hours apart? Telesat officials leaped quickly into the media with claims that the Anik E-1 problem was an electronic malfunction in the stabilising circuits inside the satellite — and that the second malfunction was "an amazing coincidence." But the satellites were only launched in 1991 so this appears highly unlikely — and 'electronic malfunction' certainly doesn't explain why the second satellite performed similar gymnastics a couple of hours later.

By the next day their confidence in passing this off as a minor hiccup was substantially less: "The prospect of recovering the $US225 million [$A300 million] (uninsured E.2) satellite is not good and, if it turns out to be caused by a circuit failure, the prognosis is not good anyway," a Telesat executive admitted.

For a geostationary satellite to move so suddenly and disastrously, the thrusters probably need to have been turned on, and the most likely cause for two such events would be an accidental base-station command or electronic short-circuit in the earth station control circuits. Telesat deny this, and maintain that the equatorial region was swept by a 'searchlight-like' beam of solar radiation which hit their satellites hard, but didn't effect the neighbours (some of which are only 1 degree away). They say that a US National Oceanic and Atmospheric Administration satellite detected a major magnetic storm about the time the malfunctions occurred, and that this storm may have overloaded the satellites' control circuits.

This is an attractive theory, but on examination it is real science fiction stuff, given the abruptness of the move, the nine-hour time difference, and the fact that no unusual disturbance was recorded in other nearby satellites. These are relatively new satellites, and they've been well protected from magnetic and electrical radiation. Usually the controllers can predict the arrival of solar wind a couple of days in advance, anyway.

The current expert theory being circulated by Telesat in the Canadian media is that the satellites were subject to excessive 'solar-flare' radiation, and that these satellites turned out to be particularly sensitive. A Telesat executive told the press that an electromagnetic storm caused a build-up of static electricity that discharged into the satellites' circuits and may have blown the transmitter that operates the gyroscopic stabilisation wheel. If this is true, then obviously satellites are a much more risky proposition than we've previously been led to believe.

This isn't the first time satellites have decided to wander off the straight-and-narrow, but it's certainly the most mysterious. A couple of years ago through operator error, one of Indonesia's Palapa satellites tumbled out of control for a few hours. In bringing it back into line the Indonesians had to expend a 2-to-3 year budget of thruster fuel — shortening the satellite's life by the equivalent amount. The Anik satellites have a life of about 10 years. Even the most optimistic scenario is that it will use about five years of the fuel budget, and take at least six months to bring E-2 back under control.

Why was it that only two Canadian satellites were affected? And why 8 hours apart? This, I'm afraid, is likely to remain one of life's mysteries. I'm willing to accept the solar wind theory for the first satellite, but I can't buy it for the second. Perhaps the fact that E-2 took up gymnastics an hour after E-1 came back under control has something to do with it? About then, I would guess, there would have been plenty of celebrating around the base-station console.

Stewart Fist

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David Turik, Managing Director for Australasian activities, joined TSB from Telecom Australia last year.

"TSB's worldwide expertise is unsurpassed in this area of the telecommunications business and our products meet international standards-including the rigorous ISO 9001 Quality Standard. This enables us to provide the highest level of service to our customers", Mr Turik said.

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Mainframe and AS/400 Data: Equal, and No Longer Separate

A new group of products is aimed at giving users easy access to big and not-so-big iron.

Recent months have brought some long-overdue relief for a problem that has long nagged most corporate downsizers: the inability of terminals and PCs to gain easy access to both mainframe and minicomputer data. The problem has been especially frustrating for users trying to migrate down from IBM mainframes to AS/400 computers, since those apparently same-world systems use mutually exclusive protocols.

A half-dozen vendors now offer hardware and software products that let end-users pull down data stored on a range of large and midrange systems, including IBM mainframes and AS/400 minicomputers, Digital Equipment Corporation VAX computers, and Unix hosts. With these products in place, users of protocol-specific equipment — such as IBM 3270 or DEC VT100 terminals or PCs equipped with 3270 emulation boards — can gain seamless access to other data streams.

The big news for downsizers is that the new products can handle 3270 traffic generated by IBM mainframes and front-end processors (FEPs) as well as 5250 data streams from AS/400 and System/3X minicomputers (see the figure on this page). Previously, single-station access to both 3270 and 5250 hosts could be gained only through 3174 cluster controllers equipped with protocol converters or through separate controllers for the two traffic types.

Integrated gateway products fall into two general categories: hardware that improves protocol access for terminals and PCs, and software that not only lets PC users pull down different types of data but also formats that data for direct use in PC applications, like spreadsheets and database management systems. Integrated hardware gateways have been available since the beginning of last year, while the new emulation software has arrived within the past few months. Right now, two such packages are available: Rumba Office from Wall Data and NetWare 5250 LAN Workstation for Windows from Attachmate.

Demand for better gateway products is soaring, now that more organisations are installing midrange systems — AS/400s in particular — as part of their long-term plan to distribute processing power outside the corporate data centre. This year and next, the installed base of AS/400s is predicted to grow at a rate of about 50,000 units per year, according to US market researchers ADM Consulting. By the end of this year, some 300,000 AS/400s will be installed worldwide, ADM says.

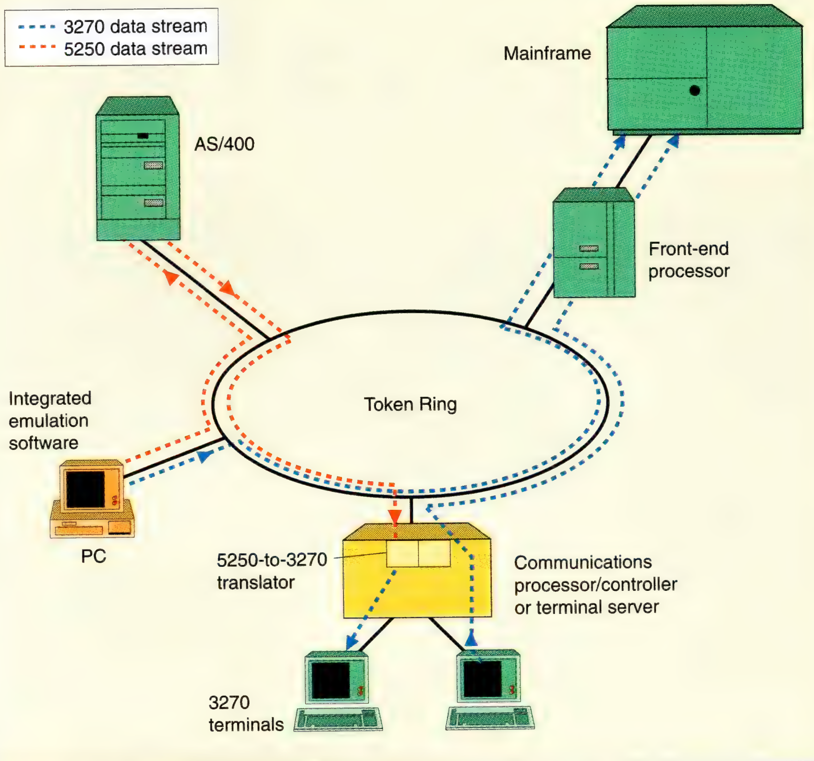
Pre-Integration Options

Without integrated gateway products, options for providing users with access to mainframe and AS/400 data are limited. Adding conversion hardware and software to 3174 controllers is one possibility. A second is to install separate controllers and terminals for 5250 traffic — an approach with some glaring drawbacks (wasted desktop space and the need for users to learn the idiosyncrasies of two keyboards). A third approach involves connecting 3270 terminals to two separate controllers — the 3174 for conventional mainframe connections, and a second device for 5250 data streams. These latter products, offered by vendors like Andrew Corporation and Telepartner International, also handle connections to PCs equipped with 3270 emulation boards, such as the well-known Irma product line from Digital Communications Associates (DCA).

Finally, managers can build PC LANs that attach to a mainframe FEP and an AS/400 host. This solution eliminates the need for duplicate hardware, but it requires

Two Streams, One Ring

Gateway products now coming to market offer seamless access to traffic from IBM mainframes and midrange hosts, including AS/400 processors. Hardware offerings include processors or terminal servers that translate AS/400 (5250) traffic to 3270 format, while integrated PC software converts both 5250 and 3270 data streams to standard PC environments, such as Microsoft Windows.



PCs to be loaded with emulation software for both environments. What's more, users have no way to integrate data from the two sources. For end-users, the separate but equal approach to mainframe and AS/400 data is almost as bad as having to deal with separate terminals.

Hardware Edges and Angles

Makers of hardware gateways claim several advantages over using 3174 cluster controllers to integrate data streams. For instance, Idea says its offering, Idea Concert, can provide more large system host attachments — up to four — than a 3174 can muster (see the table on page 41). Cray Communications and Idea handle connections to DEC VT100 terminals in addition to 3270 and 5250 terminals. Memorex Telex offers links to Apple Macintoshes and Unix workstations with its 9400 Enterprise Communications family. US-based Renex has built an X.25 packet assembler/disassembler (PAD) into its Rpad-2 communications controller to provide easy wide area network access for branch offices.

The gateway hardware products now available in the marketplace approach the integration issue from different angles, which means each must be evaluated for its usefulness in a specific network setting. For example, while Idea and Cray Communications emphasise their host connections, Memorex Telex touts its ability to reach out to all PC users, while Renex stresses its branch-office fit.

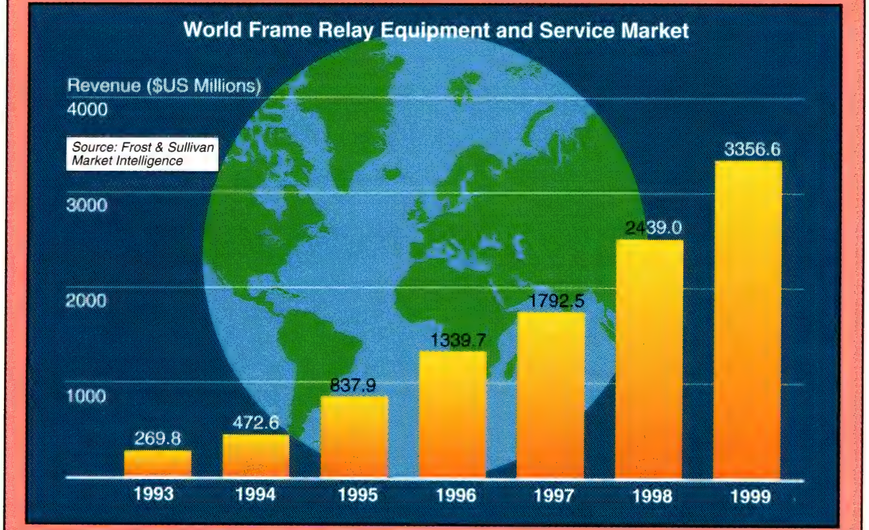
The Idea Concert communications processor enables 3270 terminals and printers to communicate with IBM System/36, System/38, and AS/400 host computers over a variety of communication links, including ISDN, SDLC, and X.25, as well as through a Token Ring or Ethernet LAN attachment. In essence, Idea Concert works as both a 3X74 controller and a 5X94 controller and protocol converter. It also offers the largest number of host connections and handles links to DEC VAX processors and VT100 terminals.

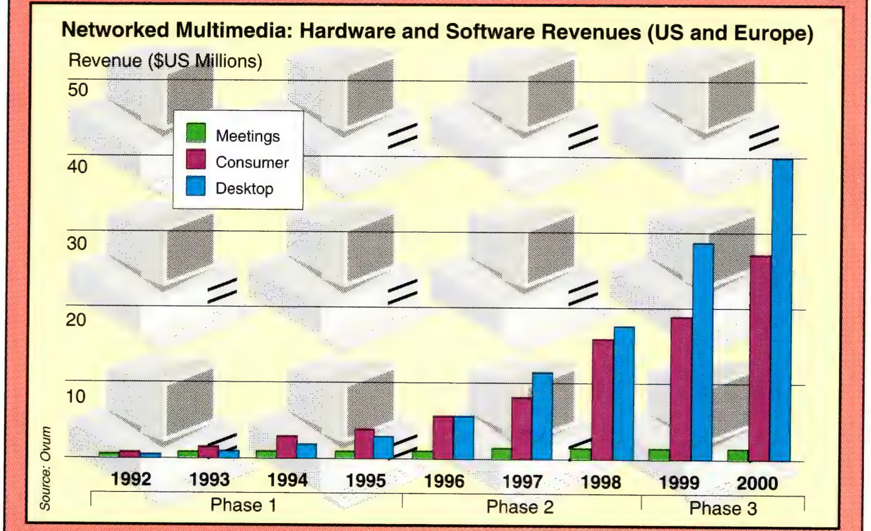
Cray Communications has elected to take the low-cost route, using a terminal server rather than a controller for connectivity. The main drawback of the terminal server approach is that it limits the number of connections and sessions the gateway can handle — the entry-level version of Cray's Multi-Functional Terminal Server (MFTS) accommodates only eight sessions. However, the MFTS allows access to the largest number of host types, extending connections beyond the IBM world to DEC and Unix hosts.

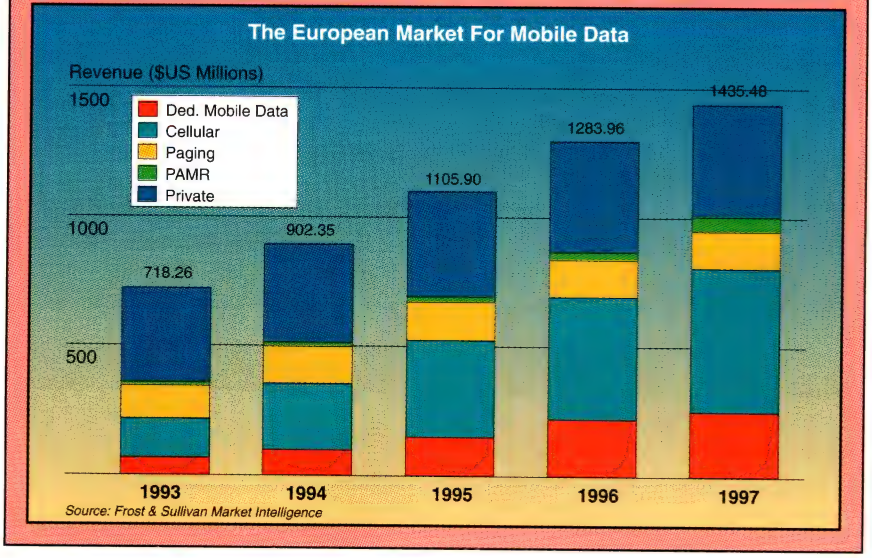
In addition to providing access to 3270 and 5250 hosts, the Memorex Telex 9432 Enterprise Gateway can act as an SDLC converter, a local router for LAN traffic, a

Continued on page 40

Market Watch







Source: Frost & Sullivan Market Intelligence

Internetworking

DLSw: A Pain-Free Approach to SNA Internetworking

Getting more than two dozen internetworking vendors to agree on anything usually requires the kind of patience and fortitude normally reserved for Middle East peace talks or AFL salary negotiations. So when those vendors strike an almost immediate accord on a proposed standard, you know that standard must be pretty important.

That's the case with Data Link Switching (DLSw), an internetworking specification that's well on its way to full-fledged standard status. Compared with the typical leisurely pace of the standardisation process, DLSw is shooting through at rubber-stamp speed. The reason is simple: DLSw promises no less than a standard method for integrating SNA traffic into TCP/IP internetworks, a feature that is absolutely critical to the long-term prospects for corporate internetworking.

Early last year IBM proposed that DLSw — a technology it developed for the 6611 multiprotocol router — serve as the basis for an industry standard for handling SNA, NetBIOS, and APPN traffic over a TCP/IP internetwork backbone. IBM's surprising offer (Big Blue isn't usually generous) was greeted with quick acceptance by competing vendors, several of which had been cooking up alternatives to the IBM way.

The happy result is that more than 20 vendors are working in harmony to flesh out IBM's proposal and implement enhancements that will make true, multiprotocol corporate networks a reality. This work is progressing under the auspices of the Internet Engineering Task Force and the APPC Implementors Workshop, a consortium founded by IBM.

Even though complete and interoperable DLSw products are still probably several months away, early DLSw implementations should be available from router vendors soon. For users, this means it's time to take a close look at what DLSw is (and isn't) and how it is likely to affect the course of corporate internetworking for the foreseeable future.

A Single Point of Light

DLSw specifies a router-based software approach that minimises the broadcast and overhead traffic normally associated with SNA and NetBIOS protocols, thus allowing them to coexist on internetworks (see Figure 1). DLSw (also known in IETF circles as RFC 1434) doesn't represent a significant technology breakthrough; in fact, almost all elements included in DLSw had been available previously from one router vendor or another. The main attraction of DLSw is that it specifies a broad range of functions, thereby reducing the number of features left to the individual (and proprietary) discretion of vendors.

In fact, the downside to DLSw is that it doesn't address all the issues associated with reliable transmission of SNA over an internetwork. The most notable grey areas involve management and security. Without a complete set of specifications, vendors still will have to deploy proprietary solutions, which of course means that complete interoperability remains a myth.

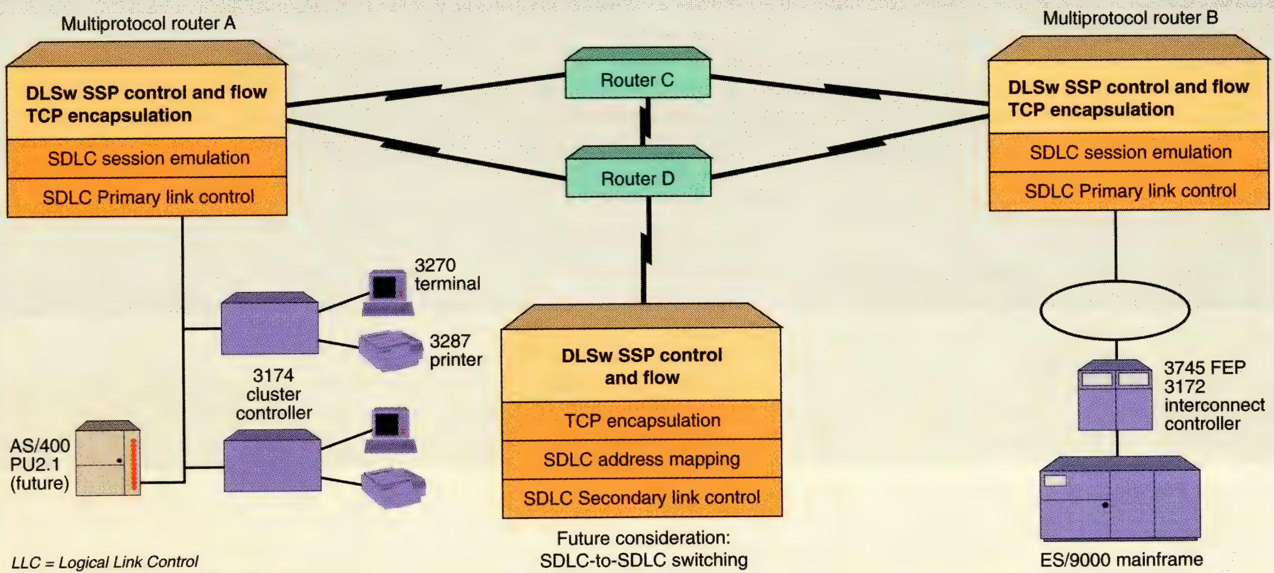
Despite this drawback, DLSw still represents a major improvement for SNA internetworking. Implementations doubtlessly will be well received.

Each type of network protocol has idiosyncrasies that can wreak havoc with other protocols. The main problem is that each protocol's assumptions about bandwidth availability limit the ability of multiple protocols to share bandwidth. The more protocols on the internetwork, the more difficult this integration problem becomes. For instance, LAN protocols like NetBIOS and IPX function as though megabits of bandwidth are always at their disposal. If they're allowed to run unchecked over lower-speed WAN links, they limit the amount of bandwidth available to other protocols. Meanwhile, SNA is a connection-oriented, time-sensitive protocol that operates as though a dedicated set of resources exists between nodes. If an SNA transmission can't be completed fast enough, the session timer expires, which means the session crashes.

The easiest way to solve the protocol competition problem is to limit the number of protocols running on an internetwork. This optimises performance for the supported set of protocols, while simplifying management and operation. And good luck to the network manager who tries to sell that one to user departments. Barring this miracle, managers that want to integrate SNA traffic onto multiprotocol backbones need

Figure 1: Sending SNA Over the Internetwork

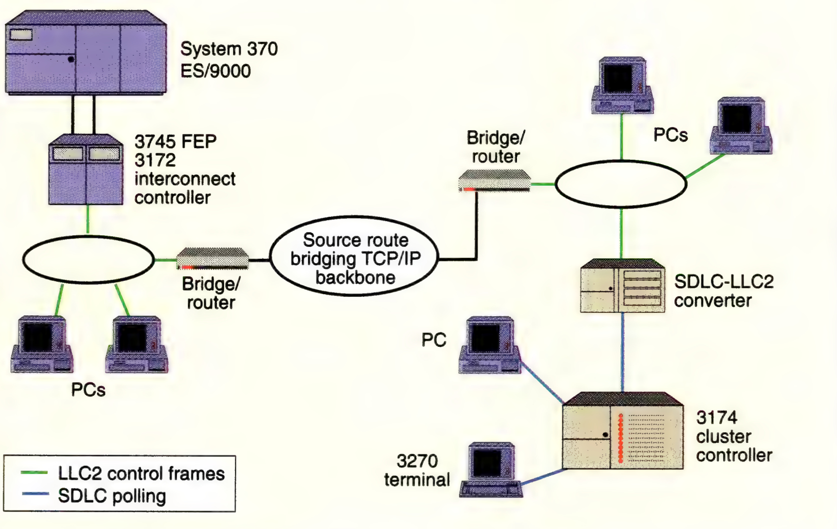
With Data Link Switching (DLSw), SDLC and LLC traffic from IBM SNA equipment is encapsulated in TCP/IP packets by routers for transmission over the internetwork.



LLC = Logical Link Control
SDLC = Synchronous Data Link Control
SSP = Switch-to-Switch Protocol

Figure 2: Keeping SNA Sessions Alive and Well

To prevent slower WAN links from timing out SNA sessions, routers built for SNA internetworking terminate SDLC and LLC traffic locally. The routers then keep sessions alive locally via polling (or spoofing) while actual requests are sent over the backbone.



routing software that keeps delay-sensitive SNA sessions alive while ensuring reasonable bandwidth access for other protocols.

Early Efforts

Over the years, almost all router vendors have developed technology to help accommodate SDLC (synchronous data link control), the SNA protocol used to connect terminal controllers to front-end processors (FEPs). The two primary approaches to running SDLC over internetworks are SDLC passthrough and SDLC conversion. Under SDLC passthrough, SDLC traffic runs side-by-side with all other protocols. Control frames (which hold NetView network management data) and polling messages (used by FEPs to obtain status information from other devices) are encapsulated in the backbone protocol with application data and sent as session-level traffic.

SDLC passthrough works only if there's enough bandwidth between any two SNA devices to ensure that transmissions can traverse the network before the session timer expires. That means that SDLC passthrough isn't an option for very large internetworks.

SDLC conversion (also known as SDLC termination) addresses the session timeout problem by terminating SNA sessions locally. Under this approach, SDLC traffic is converted to logical link control (LLC) or LLC2 packets by a conversion device — either a router or an SDLC server. LLC and LLCw, used for communications between FEPs and SNA gateways or controllers via Token Ring networks, have considerably less overhead than SDLC. The LLC frames are then encapsulated and sent over the internetwork.

Local Termination

Like SDLC, LLC and LLC2 are time-sensitive protocols. To make sure that SDLC conversion sessions do not time out, routers terminate the SNA session locally (see Figure 2). In essence, the routers keep feeding expected acknowledgments to their local devices (a process known as polling or spoofing). Local devices continue to operate as though they are directly linked in a session, when in fact the routers are acting as their intermediaries.

If SDLC sessions are terminated locally, vendors must still provide a way for status information to get from one side of the link to the other. If they don't a link failure at one end (such as a 3270 terminal malfunction) wouldn't be acknowledged at the other end, which means the second node in the session would keep the failed session open. To avoid this problem, vendors generally implement some sort of proprietary protocol between their routers that transmits a limited amount of status information. (For a more detailed discussion of SDLC passthrough and conversion see 'Smashing the SNA Internetworking Language Barrier,' in the September 1993 edition).

Along with SDLC conversion, router vendors offer technology to handle NetBIOS traffic over TCP/IP backbones. The amount of overhead generated by NetBIOS applications can dwarf that from SDLC or LLC2. The primary culprit is the use of broadcast messages to locate NetBIOS session partners. Broadcasting means messages are sent to every node on the network — a technique that can be handled by multimegabit LANs but that can be devastating to internetworks with low-speed WAN links.

The most effective approach to minimising NetBIOS overhead is to use name caching in routers. When a local NetBIOS application issues a broadcast message to establish a session, its local router will store the response, along with the enclosed routing information for the responding node, in cache memory. The next time a local application requests a session with that node, the router uses the information stored in cache to establish the session, eliminating the need to broadcast a session establishment message.

Enter DLSw

The problem with all these technologies is that they are proprietary. Products from different vendors don't work together, which can be particularly troublesome given the fact that products from different router makers have different strengths and weaknesses. For instance, one router vendor may have developed a top-notch way to handle NetBIOS overhead, while another has an optimal solution for SDLC conversion. But because their routing software isn't compatible, users have to choose one or the other.

DLSw is intended to eliminate interoperability problems by defining standard ways to handle SDLC, LLC2, and NetBIOS traffic. The spec comprises two main components: a data link switch and data link control segments.

The data link switch, typically housed in a router with optional software, maintains a list of all DLSw routers in the internetwork. The data link switch also establishes and maintains connections with other DLSw routers using the switch-to-switch protocol (SSP) (see Figure 3 on page 38). Data link control segments are software that communicates with attached devices, such as communication controllers or gateways. These segments are responsible for such tasks as frame acknowledgment, address translation, and error recovery.

Beyond TCP

In the initial DLSw spec, SSP runs on top of TCP, the most common internetwork protocol. In future versions, however, DLSw could also accommodate different transport mechanisms, such as OSI's TP4. Likewise, the initial DLSw spec covers SDLC and Token Ring data link control segments; other segments could be developed in the future, including segments for FDDI, Ethernet, ATM, SDLC Secondary, and bus-and-tag and Escon host channels.

SDLC Secondary, which IBM has built into its DLSw implementation for the 6611 router, is a mode of operation in which a device responds to, rather than generates, SDLC polls. (Devices that generate polls are called SDLC Primary.) In SNA network parlance, a FEP is considered an SDLC Primary device, while a communications controller is an SDLC Secondary device.

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The Network Fabric of Computing

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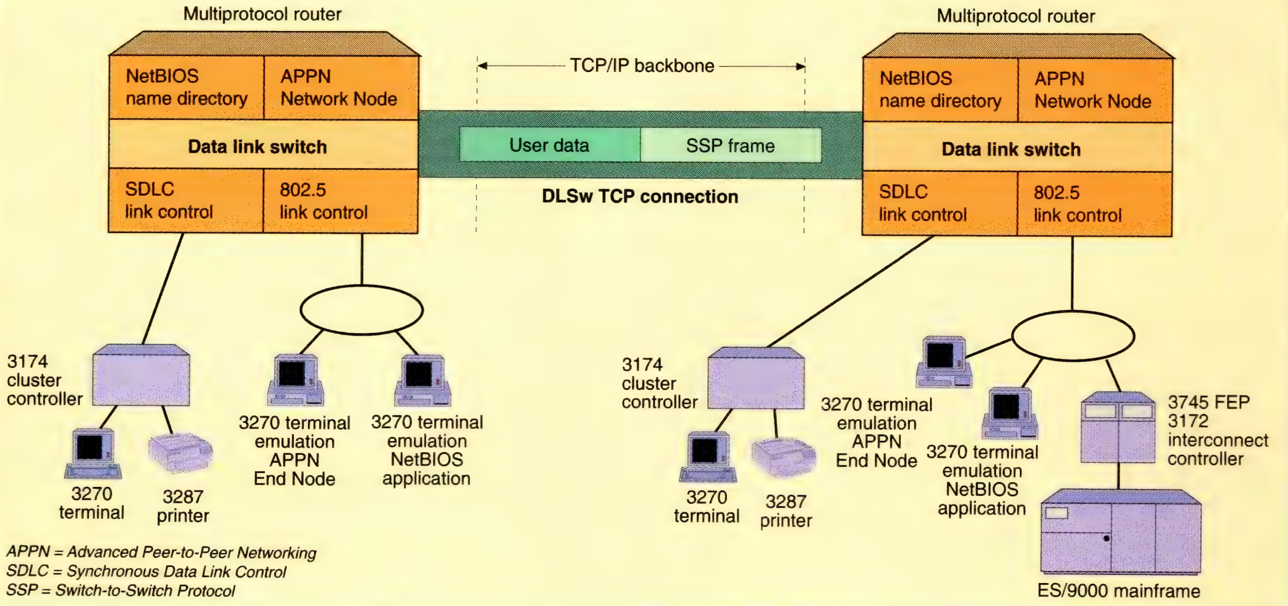
Figure 3: Switch-to-Switch Communications

Routers equipped with DLSw software exchange information using SSP (switch-to-switch protocol) frames that accompany encapsulated data. Routers also use NetBIOS name directories to keep track of all other DLSw routers on the internetwork.



APPN = Advanced Peer-to-Peer Networking
SDLC = Synchronous Data Link Control
SSP = Switch-to-Switch Protocol

Routers with SDLC Secondary support can be used to implement Token Ring-to-SDLC connections as well as SDLC-to-Token Ring connections. This will allow more complex topologies to be built, although the downside is that performing multiple conversions may degrade performance.

Like most standards, DLSw lays out a basic level of compliance. DLSw provides all the features normally furnished by SDLC conversion (including SDLC polling and network management control frames), LLC2 conversion, and NetBIOS name caching. It also performs basic recovery functions (taking action to bring remote devices back on-line should they come down temporarily).

At minimum, a DLSw implementation will handle one or more multidrop SDLC lines, the most common kind of line in SNA environments. SDLC Primary traffic will be supported on these lines, as will downstream PU2.0 (Physical Unit 2.0) devices (such as 3174 controllers and PC-based SNA gateways).

SDLC protocol handling beyond this baseline will be up to individual DLSw implementors. This means there will be some variation between DLSw implementations from different vendors when it comes to supported PU types, frame sizes, and the numbers of lines and devices.

Besides SDLC Secondary support, a lot of DLSw developers are discussing the possibility of including PU2.1 connections in the standard. PU2.1 devices are capable of looking like switched major nodes (dial-up links), rather than controllers connected via dedicated lines.

It's important to note that while DLSw is designed to cut the risk of session timeouts, such timeouts still can occur if traffic levels become too high.

Several approaches, including protocol prioritisation schemes or bandwidth reservation systems, could be used to virtually guarantee session safety, but DLSw developers aren't expected to include any such schemes in the first version of the standard. Individual vendors could implement session protection, but doing so would jeopardise interoperability. The hope is that DLSw standards developers eventually will see their way to including this important feature in a subsequent version of the standard.

Looking Ahead

Along with handling the current problem of integrating both SDLC and LLC traffic into LAN internetworks, DLSw addresses what amounts to IBM's next-generation networking scheme: APPN (Advanced Peer-to-Peer Networking).

Because APPN is not yet widely available in any form, exact details of how it will be accommodated in internetworks aren't set. But early indications are that DLSw's APPN support will be comprehensive. The version of DLSw built into IBM's 6611 router handles connections between APPN Network Nodes (devices capable of routing APPN traffic) regardless of whether the network backbone is TCP/IP or APPN. APPN implementations from third-party router vendors are expected within the next year.

In addition to the omissions already mentioned (such as SDLC session failsafes), developers working on the DLSw standard eventually must address several important areas to ensure interoperability between DLSw implementations from different vendors. The two most pressing are flow control and a definition of a base set and an option set for the standard. (The IETF's DLSw working group has set up committees to deal with these two areas.)

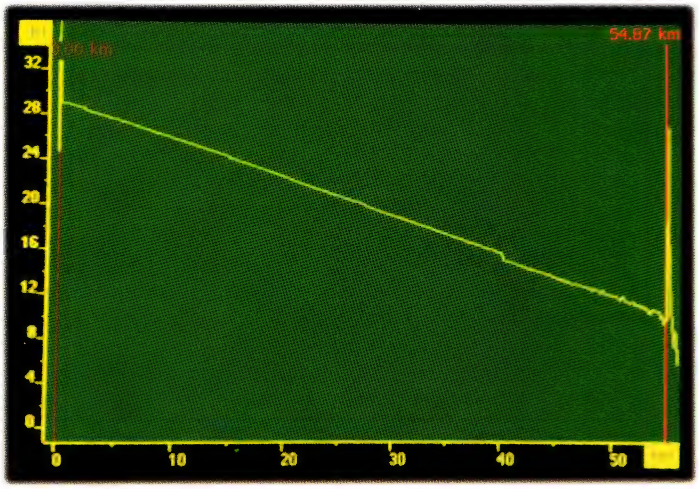
Flow control is critical for ensuring that session information is not lost and that all implementations are capable of making the most efficient use of the TCP/IP pipe. Base set and option set definition is important to ensure that products from different vendors provide the same feature sets. The base set of standards will serve as a lowest common denominator for interoperability. Option sets will offer extended features and will be different from vendor to vendor.

Change management in the DLSw network must also be addressed. DLSw's simplification of the APPN Network Node configuration process makes it all the more important to be able to change quickly and easily DLSw address pairs and other parameters, such as IP addresses. Ideally, managers should be able to perform change management from a central location.

Security functions are also crucial. For example, it may be desirable to give network managers the ability to restrict the initiation of session between given sets of supported devices or to block application (NetBIOS or SNA) user session initiation requests altogether.

William Donovan is Director of SNA Strategic Marketing at Proteon Inc., a manufacturer of internetworking products.

Before you can find one event in this waveform,



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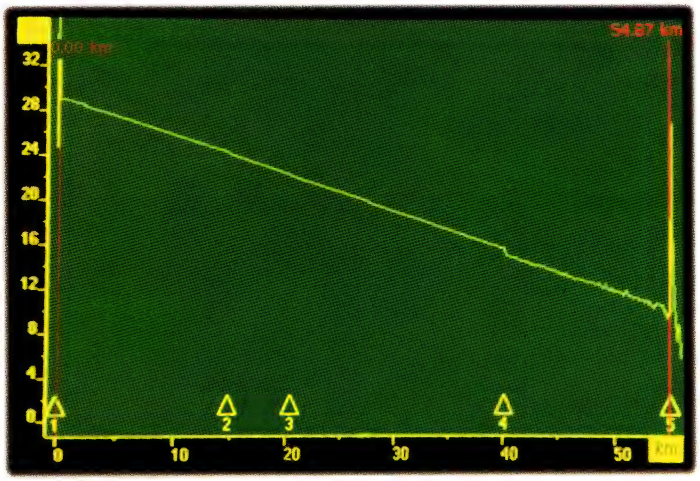

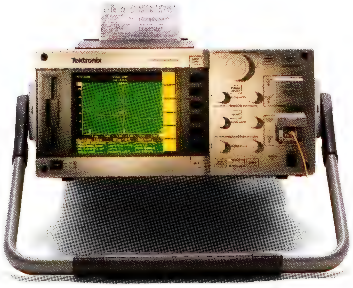

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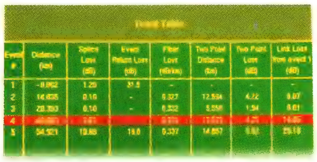

View multiple events on the easy-to-understand Event Table.

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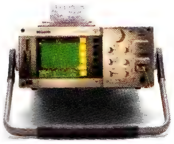
Twisted Pair Cable Analyzer

1503C Metallic
Time Domain Reflectometer



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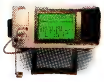

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FiberChamp™
Optical Power Meter

Host Access from page 34

Novell NetWare file server, and a NetWare for SAA server. Integrating these functions into one device provides simpler network management, the vendor contends.

Meanwhile, Renex is targeting its Rpad-2 to branch-office users who need multiple host connectivity over an X.25 network. The Rpad-2 links standalone or LAN-attached PCs to multiple mainframes or IBM AS/400s. The Rpad-2 performs protocol conversions between 3270, 5250 and ASCII traffic at the local site. It can handle up to four WAN ports, each operating at up to 64Kbps. The Rpad-2 accommodates up to 32 terminals, with as many as five host sessions each. The unit can be fitted with a Token Ring interface for attachment to a local host.

Beyond Emulation

While most integrated gateway hardware products can help squeeze more life out of older equipment like 3270 terminals, the software packages now hitting the shelves hold the promise to do more for PC users. For those users, access to host-stored data isn't enough; they also need to be able to manipulate that data with their favourite local applications.

To date, corporations have relied on running separate terminal emulation packages at each PC to gain access to mainframe and IBM AS/400 environments. However, these packages often provide only basic services, such as file transfer capability and the ability to run a host application in terminal mode. Data simply is presented to the user in its native screen format.

Wall Data's Rumba Office and Attachmate's NetWare 5250 LAN Workstation for Windows go beyond basic terminal emulation to offer development tools that more tightly integrate the PC and host environments. In essence, these packages give users a way to bring cumbersome host data into shrink-wrapped PC applications.

Like the new hardware offerings, the software packages from Wall Data and Attachmate take different approaches to the integration issue. Rumba Office lets users capture host data for local manipulation without much customisation, while Attachmate's package gives developers a tool kit to build links to applications running under Microsoft Windows.

Rumba Office, which made its debut last October, combines conventional terminal emulation with the ability to capture (rather than simply display) 3270 and 5250 data for use in PC applications.

Wall Data is positioning its product as a complement to PC-based application development tools, such as Visual Basic from Microsoft, which can be used by programmers who aren't expert in the ways of host databases. Without integration packages, giving PC users access to mainframe data requires mainframe programmers to write code for the host database to pull out specific fields for importing into a desktop application. Users can't access any fields not previously set up by a programmer.

For example, if a PC spreadsheet is being used as a front end to a database of sales records, and those records aren't set up for access, the user has little choice but to call up the records on a screen in terminal emulation mode and write them down separately, entering them later into the spreadsheet — not exactly a scenario that smacks of productivity.

What's more, writing those customised programs isn't exactly a breeze, even for the most experienced programmers. To build a customised program that lets PC users view sales records through their applications, a mainframe programmer must not only know the ins and outs of the host database but also predetermine each field to be used in the PC spreadsheet and each iteration of how the information is to be manipulated.

We came. We s

Of course, we're not normally ones to boast, but in this case, it's too hard to resist. Recently, *Communications Week* tested several internetworking devices in multi-protocol environments. 3Com's NETBuilder II® earned a perfect score in every single test scenario. The first perfect overall score recorded. Anything they could dish out, this router could take.

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And so flexible, it can support Novell's IPX, AppleTalk,

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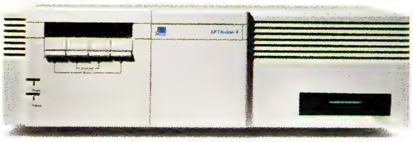
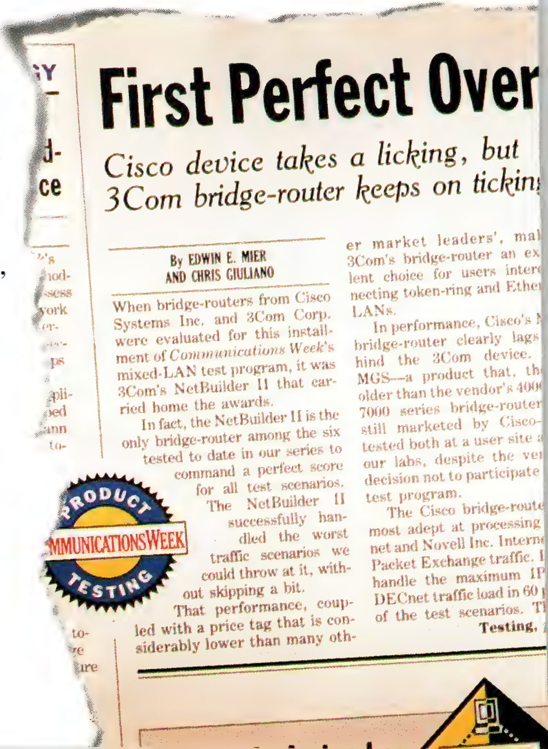




First Perfect Over

Cisco device takes a licking, but 3Com bridge-router keeps on tickin

By EDWIN E. MIER
AND CHRIS GIULIANO

When bridge-routers from Cisco Systems Inc. and 3Com Corp. were evaluated for this installment of *Communications Week*'s mixed-LAN test program, it was 3Com's NetBuilder II that carried home the awards.

In fact, the NetBuilder II is the only bridge-router among the six tested to date in our series to command a perfect score for all test scenarios.

The NetBuilder II successfully handled the worst traffic scenarios we could throw at it, without skipping a bit.

That performance, coupled with a price tag that is considerably lower than many other market leaders', ma 3Com's bridge-router an ex lent choice for users inter necting token-ring and Ethe LANs.

In performance, Cisco's bridge-router clearly lags hind the 3Com device. MGS—a product that, th older than the vendor's 400 7000 series bridge-router still marketed by Cisco tested both at a user site our labs, despite the ve decision not to participate test program.

The Cisco bridge-rout most adept at processing net and Novell Inc. Intern Packet Exchange traffic. handle the maximum I DECnet traffic load in 60 of the test scenarios. T

Testing,

PRODUCT
COMMUNICATIONSWEEK
TESTING

Reaching Out to the Midrange, Hardware Style

VENDOR	PRODUCT	PRODUCT TYPE	HOSTS	END-DEVICES
Cray Communications (02) 451 6655	Multi-Functional Terminal Server	Modified terminal server	IBM mainframe, AS/400, DEC VAX, Unix	3270, 5250, DEC VT100, async terminals
Idea IDE Technology (02) 899 9900	Idea Concert	Communications processor with integrated bridge/router	IBM mainframe, AS/400, DEC VAX	3270, 5250, DEC VT100, async terminals
Memorex Telex (02) 805 5805	9400 Enterprise Communications family	Communications processor that can operate as a NetWare for SAA server, a Telnet 3270 gateway, and an SDLC converter	IBM mainframe, AS/400	LAN-attached PCs, Macintoshes, X terminals, Unix workstations, NetWare workstations

And if that isn't pain enough, the effort has to be duplicated for AS/400 access, since AS/400s and mainframes make use of different screen formats. Needless to say, any attempt to customise the spreadsheet to meet the needs of individual users is impossible under this approach.

A Better Way

To avoid this kind of futility, Rumba Office lets users pull mainframe and minicomputer into a Microsoft Windows screen, capture it in a PC file, and then manipulate it in a Windows-based spreadsheet. Rumba office works with Unix and DEC VAX data as well as mainframe and AS/400 data.

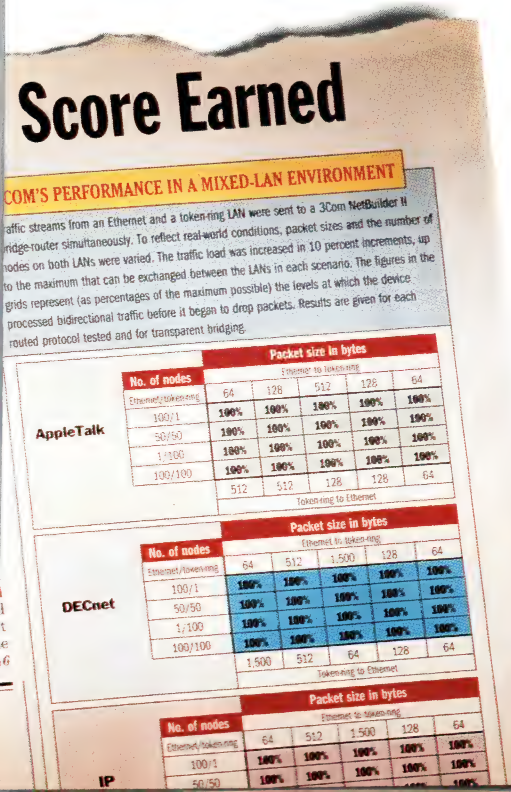
Attachmate takes a similar tack but focuses on the sometimes neglected application developer. With NetWare 5250 LAN Workstation for Windows, programmers can use Windows' Dynamic Data Exchange feature to automatically update information in applications running in separate windows. With this feature, for instance, a user could manipulate important captured data in a spreadsheet, and then automatically display that updated information in a second application.

Attachmate offers PC-based development tools for further customisation. For example, a macro recorder lets users save a sequence of keystrokes, such as those used to log onto a host. Those keystrokes then can be accessed by clicking a mouse.

Rumba Office and NetWare 5250 LAN Workstation for Windows are the first of what is expected to be a slew of software packages aimed at giving personal computers 5250 and 3270 emulation capabilities with extended features to tightly bind data to the front-end applications. Leading makers of terminal emulation cards, including DCA, Eicon Technology, and Netsoft, also say they will offer native versions of their products for Windows NT that will allow access to both mainframe and AS/400 environments.

Salvatore Salamone

aw. We routed.



Score Earned

COM'S PERFORMANCE IN A MIXED-LAN ENVIRONMENT

affic streams from an Ethernet and a token-ring LAN were sent to a 3Com NetBuilder II
ridge-router simultaneously. To reflect real-world conditions, packet sizes and the number of
nodes on both LANs were varied. The traffic load was increased in 10 percent increments, up
to the maximum that can be exchanged between the LANs in each scenario. The figures in the
grids represent (as percentages of the maximum possible) the levels at which the device
processed bidirectional traffic before it began to drop packets. Results are given for each
routed protocol tested and for transparent bridging.

AppleTalk

No. of nodes Ethernet/token-ring	64	128	512	128	64
100/1	100%	100%	100%	100%	100%
50/50	100%	100%	100%	100%	100%
1/100	100%	100%	100%	100%	100%
100/100	100%	100%	100%	100%	100%
Token-ring to Ethernet	512	512	128	128	64

Packet size in bytes: Ethernet to token-ring (top), Token-ring to Ethernet (bottom)

DECnet

No. of nodes Ethernet/token-ring	64	512	1,500	128	64
100/1	100%	100%	100%	100%	100%
50/50	100%	100%	100%	100%	100%
1/100	100%	100%	100%	100%	100%
100/100	100%	100%	100%	100%	100%
Token-ring to Ethernet	1,500	512	64	128	64

IP

No. of nodes Ethernet/token-ring	64	512	1,500	128	64
100/1	100%	100%	100%	100%	100%
50/50	100%	100%	100%	100%	100%

IBM NetBIOS/NetBEUI, Banyan VINES, DECnet, XNS, OSI, and TCP/IP protocols. Not to mention any LAN or WAN media, including FDDI and other high-speed media that come along.

NETBuilder's modular design means interface, media, topology, and technology changes can be made in no time. Plus, hot-swappable modules make network problems easy to repair, with absolutely no interruption in service. In fact, meantime board replacement is less than five minutes. Want to know more about NETBuilder II? Give us a call at **(02) 959-3020, ext. 20.**

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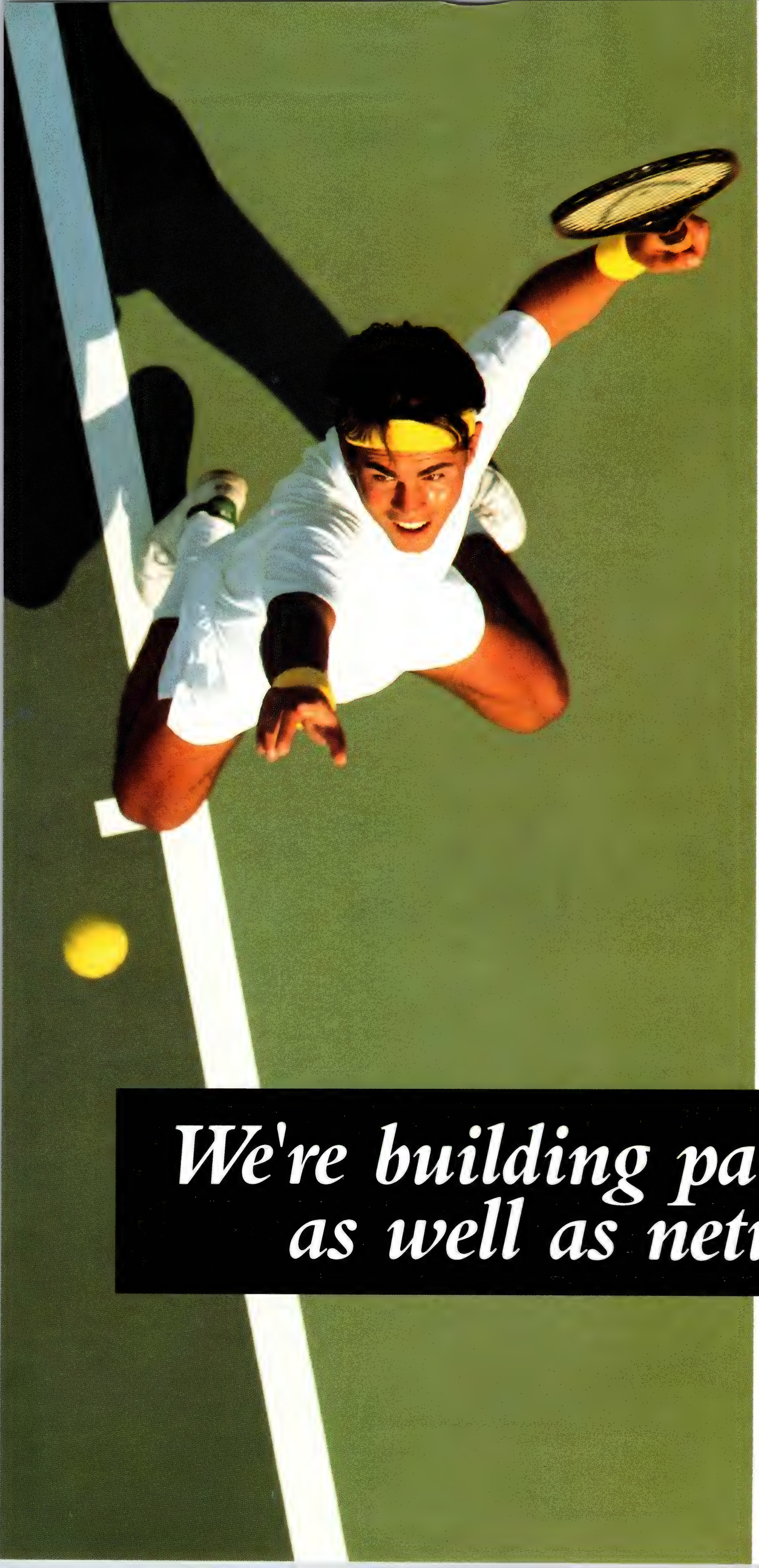

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Data Comm Lab Test

Networking Through Thin Air

Cordless phones, beepers, PDAs: consumers looking to communicate with no strings attached have plenty of slick gadgets at their disposal. Wireless LANs for small workgroups have been around for more than three years. But corporate network managers looking to ease the tie that binds when it comes to LAN interconnect have had little opportunity to do so. At least that's been true thus far. A new class of wireless internetworking gear is starting to emerge, though, that makes it possible to link local area networks across an enterprise without getting into the ducts and pulling cable.

To get a handle on how these products measure up, the Data Comm Test Lab has evaluated three wireless products suitable for enterprise applications: the Cylink Airlink 256, a modem device that works with spread spectrum transmission technology; the Laser Communications LCI L00-28, a modem which uses laser beams to transmit traffic; and Motorola's Altair Vistapoint, a remote bridge/modem which operates at microwave frequencies.

Note that these by no means represent the only wireless products on the market; there are others, such as Persoft's Intersect Remote Bridge and the Solectek Airlan/Bridge which are not yet available in Australia, and some which are on sale here but not included in the US-based Data Comm Test Labs' evaluation.

These latter products range from the relatively well-known radio-based NCR WaveLAN and Proxim RangeLAN local area network products, through to the little-known and more exotic infrared offerings from Jerusalem Optical Link Technologies (JOLT) which can operate at speeds up to a claimed 125Mbps.

NCR's WaveLAN range includes the Wavepoint Remote Bridge, a spread spectrum wireless product which operates in the 2.425GHz frequency range at 2Mbps and is suitable for links over distances of up to 180 metres. Although it only operates at 242-Kbps, Proxim's RangeLAN family of wireless modems can reach up to 250 metres, according to the vendor's Australian distributor, Smart Radio Modems.

The new Spectrum Management Agency (SMA) handles local licensing arrangements for wireless networking equipment, and so far has licensed wireless technologies to operate in the Industrial, Scientific and Medical frequency bands of 915MHz-928MHZ, 2.4-2.45GHz, 5.725-5.875GHz and 19.15-19.21-GHz. A $29 licence fee is payable for wireless units using spread spectrum technology. The licensing arrangements for microwave equipment are somewhat more complex, and depend on the type of equipment in use, its power levels and its transmission distance.

Under Evaluation

Wireless is by no means a one-size-fits-all technology. Spread spectrum equipment can be deployed without worrying about line-of-sight access. It's also fairly secure — indeed, the technology was originally developed by the US military for protected communications. On the downside, it's relatively slow — at least when compared with microwave or laser. And interference can take a sizable cut out of data rates.

Microwave gear, in contrast, delivers zippier communications. Since these devices operate within a very narrow frequency range, it's tough for eavesdroppers to intercept transmissions. But microwave is also restricted to line-of-sight applications.

Laser-based products offer the highest data rates — up to 95% of wire speed. Unfortunately, the line-of-sight restrictions once again apply. And distance becomes a problem beyond one kilometre.

Still, after sizing up the feeds and speeds, wireless may be a niche technology (at least when it comes to LAN interconnect), but it has the potential to be a good-sized niche. Wireless bridges and modems are naturals when it comes to temporary LAN links, disaster recovery, and anywhere where wiring would be prohibitively expensive.

Actually, the best fit for wireless bridges and modems may be for remote bridging. Like their conventional counterparts, wireless networking equipment typically connects LANs at up to 2Mbps. In short-distance applications where leased-line costs are an issue, going wireless means that WAN bandwidth is free.

Cutting the Cable

If net managers want to take advantage of wireless technology, they've got to understand what it can offer. Unfortunately, the different transmission technologies employed make it very difficult to draw conclusions about price/performance. And variations in product type also make it tough to compare distance and interference limitations.

For all that, there are some general rules. The type of antenna used to transmit and receive data plays a very large role in transmission distances. All of the products tested except LCI's laser modem come equipped with omnidirectional antennas, which are appropriate for short-range use (152 to 396 metres). The LCI box doesn't use antennas at all.

All of the tested spread spectrum and microwave gear also can be equipped with directional antennas, which can transmit signals up to 40 kilometres. But maximum distance depends upon many factors, including signal strength, the antenna's decibel gain, and atmospheric conditions. Moreover, directional antennas must be aimed very precisely to ensure maximum channel utilisation. That's why most of them come with range finders to help network managers line up their signals. (The maximum distance limits given in this article assume line-of-sight conditions. Strictly speaking, devices using spread spectrum and microwave technology do not require line-of-sight paths, but distances will decrease as more obstacles are introduced).

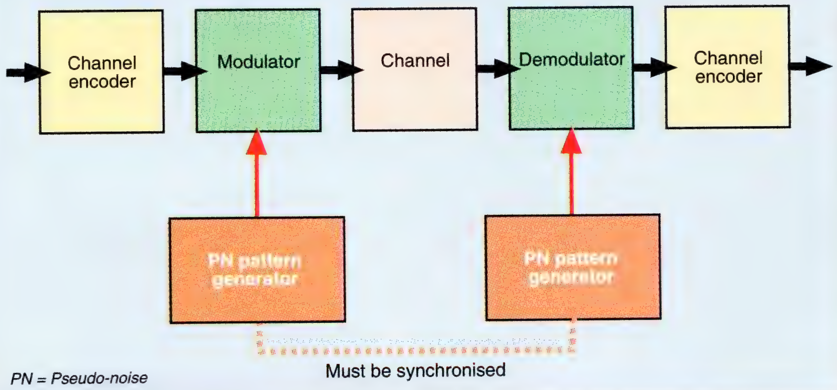
Catch a Wavelength

The products evaluated also use very different portions of the electromagnetic spectrum, each having its own characteristics. Spread spectrum products, for instance, generally operate within the 915 to 928MHz frequency range and offer maximum data rates of roughly 2Mbps. But remember that 'spread spectrum' actually refers to a security technique rather than a specific frequency. The technology could be applied to other portions of the radio bandwidth.

Spread spectrum's security features are likely to be a key selling point for net

Figure 1: Spread Spectrum Security

By transmitting data along with pseudo-noise (PN), spread spectrum technology boosts security. Sending and receiving PN patterns must be synchronised for the encoding to work.



PN = Pseudo-noise

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Putting Wireless to Work

VENDOR	PRODUCT	TYPE	TRANSMISSION TECHNOLOGY	CARRIER FREQUENCY	MAXIMUM BANDWIDTH (MBPS)	MAXIMUM DISTANCE
Proxim Smart Radio Modems (064) 523 112	RangeLAN ISA	Modem	Spread spectrum	924MHz	0.242	150 metres (indoor); 250 metres (outdoor)
Cylink Datamatic (02) 449 8133	Airlink 256	Modem[1]	Spread spectrum	915-928MHz	0.256	396metres (omni-directional); 32km (directional)
JOLT Hannamax Hi-Tech (02) 564 3732	UWIN 2100B	High speed laser link	Laser	820 nanometres	10 - 125	100 metres
	UWIN 2100D	High speed laser link	Laser	820 nanometres	10 - 125	100 metres
Laser Communications ADE Network Technology (03) 543 2677	LCS L00-28	Modem[2]	Laser	800-900 nanometres	10 (Ethernet), 16 (Token Ring)	1,006 metres
Motorola Altair Cray Communications (02) 451 6655 Hardie Networks (03) 890 0900	Altair Vistapoint	Remote bridge/modem	Narrowband microwave	18.6-19.3GHz	5.3	152 metres (standard); 1,198 metres (long range)
NCR Datamatic (02) 449 8133	Wavepoint	Remote bridge	Spread spectrum	2.4 - 2.45GHz	2	183 metres (omnidirectional); 2.4km (directional)

1. Tested with Tokenmaster 5000 bridge/router from Acsys
2. Tested with NETBuilder II bridge/router from 3Com

managers wondering how they can protect themselves when thin air is transformed into a transmission medium.

Spread spectrum (true to its military heritage) camouflages data by mixing the actual signal with a so-called pseudo-noise (PN) pattern and then transmitting the two (see Figure 1 on page 43). PN patterns shift the signal's frequency or phase at near-random intervals, making it extremely difficult for intruders to intercept an entire message. For PN protection to be effective, however, transmitting and receiving devices must use synchronised PN pattern generators, so that only the intended receiver can decode the true signal. Network managers who want an additional measure of security also can encrypt data before sending it.

PN encoding has another advantage: it allows many signals to be sent over the same frequency range. PN patterns are generated over a wider area of the spectrum than the true signal — even if multiple transmitters send signals at exactly the same frequency, a receiver will only be able to decode signals if it shares the same PN pattern as the transmitter.

A further advantage to spread spectrum devices is that they are not limited to line-of-sight applications. Radio waves in the 915 to 928MHz range are long enough to pass through a number of interior walls and still carry data. Obviously, performance will suffer as more obstacles are introduced, but this ability does give net managers more leeway when deploying products.

The Lab did find one problem with spread spectrum devices — interference. In theory, this type of equipment should be relatively immune to interference (one of the benefits of spread spectrum technology). In practice, however, they turn out to be surprisingly susceptible. The Test Lab's findings suggest that network managers may not be able to locate multiple spread spectrum devices at the same location without degrading throughput.

High Frequency Hot-Rods

Two of the products evaluated use other transmission technologies: Motorola's Altair Vistapoint relies on narrowband microwave frequencies (in the 18.6 to 19.3GHz range), which are more than 20 times higher than those used by spread spectrum products. Laser Communications' LCI L00-28 operates at about 366 terahertz (THz).

Higher frequencies, pure and simple, mean more bandwidth. The Lab was able to send traffic through the Altair Vistapoint at 5.2Mbps, while the LCI could bridge Ethernet traffic at almost 9.5Mbps, or 95% of wire speed. In comparison, the speediest spread spectrum device ran at 1.7Mbps.

One of the things the Lab learned during its evaluations is that microwave technology also looks very promising for network managers concerned with security. Motorola's bridge/modem does not employ PN patterns, but microwave signals are much narrower than those transmitted by spread spectrum gear, which makes them far more difficult to locate.

Access to the microwave spectrum is strictly controlled by the SMA; users of microwave transmitters must pay a 'per-end' licence fee of either $57 or $113, depending on the type of equipment being used. Unlike the spread spectrum frequency range, where the airwaves are relatively crowded, microwave frequencies offer users the security of knowing their data travels only in one carefully partitioned slot.

When it comes to laser-based internetworking products, very high data rates must be balanced against relatively short transmission distances. In essence, lasers convert incident radiation into a highly coherent stream, typically through a lens. Since this narrowly focused stream dissipates quickly over distance, the technology is best suited to short hops.

Laser and microwave devices are beset by one other limitation: Both require a clear line of sight for transmission. Because of their high frequencies, microwave and laser signals degrade much faster as they hit obstructions.

In this initial evaluation of wireless devices, the Lab was most interested in how well the products could connect conventional (wired) LANs. Consequently, most of the testing aimed to establish best-case throughput benchmarks using the wireless gear to link local area networks over short distances. As indicated, we also performed some experiments to measure the effects of interference.

For the throughput tests the Lab used the same method employed with conventional remote bridges: it connected two Ethernet or Token Ring LANs to a pair of wireless bridges (or wireless modems connected to wired bridges), sent traffic from one local area network to the other, and then noted the best-case throughput — measured as the point at which the bridge at the receiving

Figure 2: Frame Handling: Ethernet

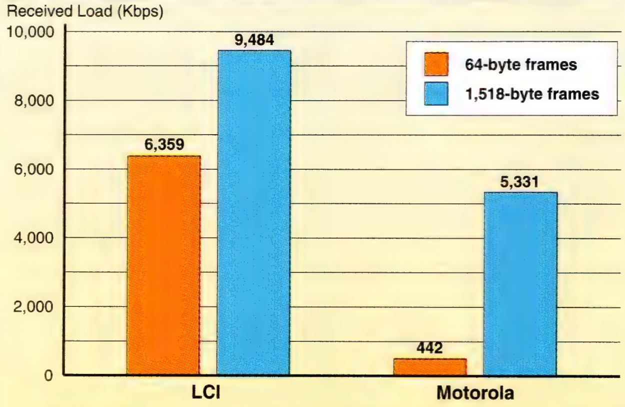


Figure 3: Ethernet Channel Bandwidth Utilisation

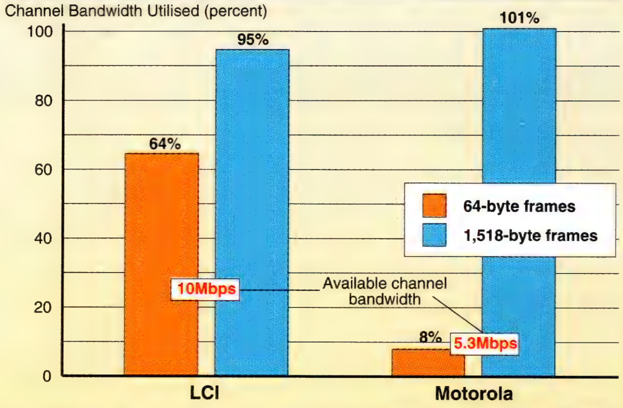


Figure 4: Frame Handling: Token Ring

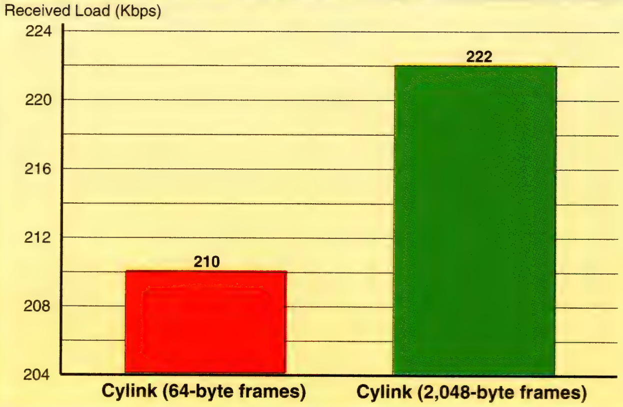
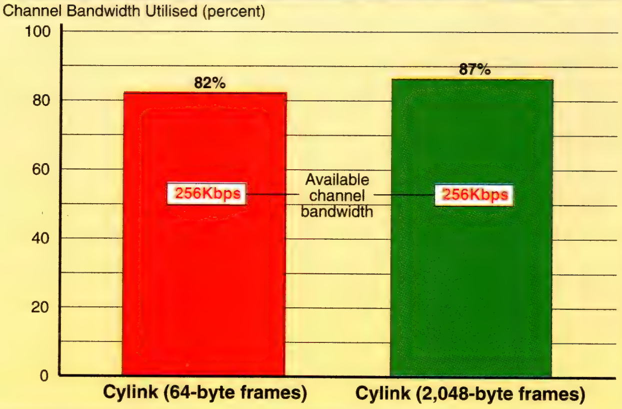


Figure 5: Token Ring Channel Bandwidth Utilisation



end of the connection started dropping frames.

What this demonstrates, in terms of raw throughput, is how much data each product can push across a link. This is important information, since it tells net managers what to expect overall. But raw throughput doesn't tell the whole story.

When the Data Comm Test Lab is working with wired remote bridges, each round of tests is typically performed at a specific link speed (for example 512Kbps). However wireless gear operates at a wide variety of link speeds, ranging from 256Kbps (for Cylink's Airlink 256) all the way up to 16Mbps (for LCI's L00-28).

Obviously, it's not fair to pit a product that tops out at 256Kbps head-to-head against one that runs at 16Kbps. In order to make a meaningful comparison, the Lab had to determine what percentage of available bandwidth each product uses.

Truth in Advertising

The raw throughput tests confirmed that the products checked out send data at close to their advertised top speeds. When it came to best-case throughput, the LCI laser modem was way out in front of the pack. It blasted 1,518-byte frames across the wireless link at 9.49Mbps (see Figure 2). LCI's modem also came out on top in handling 64-byte frames, with a data rate of 6.36Mbps. (The LCI unit was connected to a NETBuilder II bridge/router from 3Com. See 'Test Methodology' on page 47 for more details.)

Motorola's Altair product placed second, pumping out 1,518-byte frames at 5.331Mbps — a rate high enough to satisfy the needs of most applications. But Motorola's microwave bridge was only able to hit 442Kbps when handling 64-byte frames.

Frame size affects all bridges to some degree, but wireless boxes seems to have a particularly hard time with small frames — a fact that became clear when the Lab measured each product's bandwidth utilisation. Motorola's Altair Vistapoint, for example, utilised 101% of channel bandwidth with large frames, but only 8% when handling small ones (see Figure 3). This is a significant difference, particularly for networks handling transaction-intensive applications that cause a large number of acknowledgments (small frames) to be sent over the link.

The difference in throughput is simple to explain. A bridge must step through the same procedure for every frame, regardless of size: It accepts each frame, examines its header, and then passes it along to the destination LAN. A data stream comprising a few large frames requires less processing than one made up of many small packets.

Token Ring Testing

Besides the Ethernet products, the Lab also tested the Cylink modem's ability to connect Token Ring LANs. Basically, the Cylink modem did what was asked of it, sending data at close to its top speed of 256Kbps (see Figure 4). Indeed, it utilised 87% of channel bandwidth when handling 2,048-byte frames and 82% of capacity with 64-byte frames, thus exhibiting much more stable performance than wireless Ethernet gear (see Figure 5). (The Cylink modem was tested with a pair of Tokenmaster 5000 bridge/routers from Acsys.)

The Lab took a simple yet effective approach to interference testing, setting up a second pair of spread spectrum devices next to the units under test and letting them blast our bits. (The Motorola and LCI products were not evaluated in this way because there was only one pair of each.) Data Comm Lab technicians also tried changing the PN patterns on the interference-generating devices to see whether this would affect performance.

The results, while not exhaustive, show that spread spectrum signals can interfere with each other, even when different signal strengths and PN patterns are used. Changing the PN patterns, however, made little difference in terms of throughput.

Cylink

When it comes to proving itself in the field, few companies have paid more dues than Cylink. Over the past few years in the US, the vendor has been deploying its wireless modems in the remote oil fields of Alaska and the Mideast.

Ali Ghassani, from Cylink's Australian distributor, Datamatic, said the products are being sold here into a wide cross-section of industries, from local government and police stations to hospitals and universities. Most customers, he said, are looking for a cheaper alternative to carrier services to connect branch offices into the main network. Cylink is a leader in long-distance wireless communications; some of its modems are deployed up to 80 kilometres apart, using specially built parabolic antennas.

But the company's primary focus is short-haul, relatively low-rate wireless communications. At the time of testing, Cylink's fastest modem operated at 256Kbps — a fraction of the rates achieved by other products in this test. At press time, the company had just introduced a 512Kbps wireless modem.

Despite their relatively low data rates, the Cylink modems offered a couple of noteworthy features. First, PN patterns can be changed via DIP switches, giving network managers an extra measure of security. Second, the Cylink modems were the only ones that allow the strength of the transmitting signal to be changed. This feature could be helpful in settings where multiple modems might possibly interfere with one another.

Testifying to the reliability of the Cylink product, Geelong Water Board's Network Administrator, Warren Stokes, said that the Board had installed two Airlink modems to connect one of the Board's branch offices at Drysdale, some 19 kilometres away, and has so far been very pleased with the success of the system, which has experienced a very low retransmission rate of around 0.5%.

Test Methodology

To measure the best-case throughput of wireless bridges and modems, the Lab employed its standard set of tests: it sent one-way traffic through a pair of bridges, gradually increasing the level until it noted frames being lost on the receiving side. In this evaluation, the Lab also measured the effects of interference on performance by subjecting each pair of spread spectrum devices to signals from another pair of spread spectrum devices.

The test bed for the best-case throughput measurements consisted of a pair of Ethernet or Token Ring LANs; the pair of bridges or modems under test; and a DA-30 protocol analyser from Wandel & Goltermann. The Cylink modems were tested on Token Ring networks operating at 16Mbps; other products were tested on Ethernet LANs operating at 10 Mbps.

Traffic was generated using RTbench, an application included with the DA-30, and received frames also were counted by the DA-30.

Because two of the products are modems only, wired bridges were used to connect them to the LANs. The Cylink modems were attached to a pair of local Token Ring bridges from Acsys. The LCI modems were attached to a pair of NETBuilder II bridge/routers from 3Com. The Lab also used a signal attenuator from HP to control the power of the test devices' transmitting signals.

Laser Communications

The name says it all: Laser Communications makes modems that communicate via laser beam — very-high-frequency equipment that has the ability to match LAN data rates.

The Ethernet version of LCI's modem incorporates a repeater that accepts data via a fibre optic interrepeater link (FOIRL). Ideally, network managers can use LCI modems and FOIRL connections to join bridges in two buildings. LCI also sells a version of its modem that supports 802.5 Token Ring repeaters. LCI's modems are housed in weatherproof casings, so they are suitable for deployment on rooftops or other outdoor locations.

The modems tested have a maximum range of one kilometre, although LCI says the laser link can be affected to some degree by heavy rain or snow. Lasers are inherently a line-of-sight technology; anything that obstructs the laser's path will cause transmissions to fail. However, lasers are not at all susceptible to interference from any radio frequencies.

Like the Cylink products, the LCI offerings are modems only. 3Com NETBuilder ll bridge/routers were used to connect them to a pair of Ethernet LANs. Throughput was no problem: link rates were about 95% of Ethernet wire speed.

Motorola Altair

A high performer over short distances, the Motorola Altair Vistapoint includes an in-

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Technology Update

New Ultra-High-Speed Fibre Device

Scientists at Northern Telecom's R&D arm, Bell-Northern Research, have developed a low-cost optoelectronic device which can quadruple the carrying capacity of fibre optic networks. The semiconductor device, called a Mach-Zender optical modulator, acts as an electronic shutter that can turn laser light on and off at extremely high speeds. The device is the first of its kind to pre-compensate for chirp, a phenomenon which causes minute changes in wavelength and necessitates the regeneration of light pulses every 40-60 kilometres in high-speed fibre optic links. The device extends the transmission range to over 100 kilometres without regeneration, and boosts transmission rates to 10Gbps.

Boost for NetWare Over ISDN

The German subsidiary of Novell and software developer HST GmbH are expected to begin shipping CAPI-Manager this month, a software package that implements an application programming interface (API) that lets users deploy different makes of ISDN adaptors to link Novell NetWare 3.X or 4.X LANs over ISDN. The CAPI-Manager software will be bundled with Novell's Multiprotocol Router software, enabling vendors to implement it on their ISDN board at no extra charge

File and Image Transfer Via Fax

Israeli firm Fontech has invented a way to send confidential files and colour pictures using conventional fax transmission. The company's new Fax-O-File technology compresses the digital data contained in the file or image and outputs the data as a grid of black dots on a white background, which can be printed and faxed, or sent direct from a fax modem. The compression process is reversed at the receiving end, reconstituting the file or colour image. According to Fontech, the technology is less vulnerable to noisy lines than ordinary modems, and compresses up to 100,000 characters onto a single fax page.

Fibre Channel Beyond the LAN

US-based vendor Trantec Networks is planning to extend Fibre Channel technology beyond the realm of the local area network to enable carriers to offer 266Mbps virtual LAN services over metropolitan area networks (MANs). The scheme involves two separate pieces of equipment — a modified Fibre Channel Switch from Ancor Communications, and Trantec's Remote Interface Module (RIM). The RIM, which can be located at the customer premises in a wiring closet, converts Ethernet packets to Fibre Channel frames, and moves these frames over the MAN to an Ancor switch at the carrier's central office. The company says using single-mode fibre cables the system could offer throughput of up to 266Mbps at distances of up to 56 kilometres.

Intel Joins PC Conferencing Group

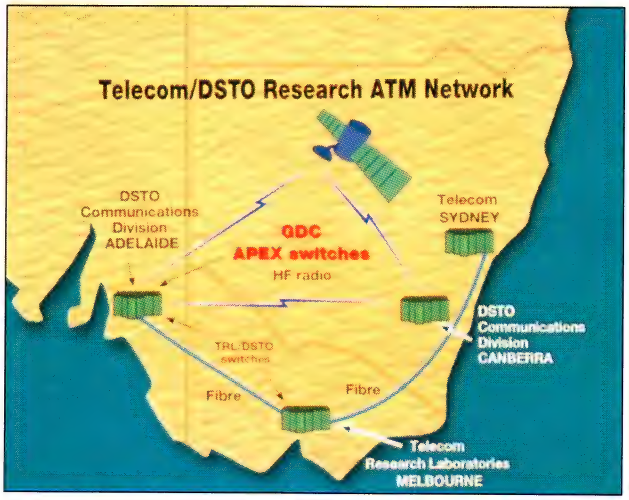
Intel Corporation announced it will join with a large group of leading computer and communications firms including Compaq, Ericsson, Lotus, NorTel, Novell, PictureTel, WordPerfect, AT&T and others in developing an open specification for PC-based personal video-conferencing. The spec will be designed to span a variety of communications infrastructures including analogue, switched digital and computer data networks, and will work in a standard PC environment.

IEEE Accepts 100VG-AnyLAN Spec

The IEEE 802.12 working group has voted to accept Hewlett-Packard's Demand Priority Protocol (100VG-AnyLAN) draft specification, which was submitted at an IEEE 802.12 interim meeting in mid-January. The specification includes the additions proposed by IBM, Proteon and Texas Instruments to allow the technology to support Token Ring LANs. To ensure Ethernet and Token Ring frame compatibility the IEEE 802.3 (Ethernet) and IEEE 802.5 (Token Ring) committees have each assigned liaisons to the 802.12 working group.

DSTO Plumps For GDC ATM Switch

Australia's first full-function ATM switch has been bought by the Communications Division of the Electronic Research Laboratories at the Defence, Science and Technology Organisation (DSTO) in Adelaide. The APEX switch from vendor General DataComm will be added to an existing ATM network which links the DSTO's Communications Division in Salisbury with Telecom Research Laboratories in Melbourne via a 34Mbps fibre optic link. The APEX product supports pure ATM cell switching and adaptation switching for non-ATM traffic, interconnection of LANs via direct Ethernet interfaces or via ATM LAN hubs, frame relay switching and transport of X.25 HDLC and SNA/SDLC framed information. A spokesperson for the DSTO said the GDC product was selected because of its ability to interface to low bit-rate modems, ability to move cell-based traffic without other protocols, and because it allowed for future connection to a Distributed Queue Dual Bus (DQDB) metropolitan area network.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tegral bridge. The Vistapoint's bridge is a self-learning type that can accommodate up to 1,000 Ethernet addresses. Its modem was the only one tested to use microwave signals. As noted, these signals are inherently more difficult to intercept than those used by spread spectrum gear.

In addition, Motorola Altair's product was the only one in this evaluation to support SNMP network management. A built-in MIB II agent allows network managers to monitor Ethernet traffic and set traps.

In the Lab's performance tests, it found that the bridge worked very well when handling large (1,518-byte) frames, in one case utilising 101% of channel bandwidth. In the case of small frames, however, it was a different story: the bridge used only 8% of channel bandwidth when passing 64-byte frames.

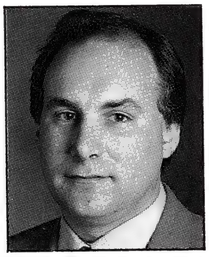
Peter Newham of Santos in Brisbane installed a Vistapoint to link two of the company's buildings in the CBD area last November, and says he has been delighted with the unit's performance. "We bought the product to solve a particular problem — we needed to link our main office building to another nearby building we had acquired as the result of a merger.

"With the lease on one building due to expire in just over a year, it was prohibitively expensive to link the two sites using cable, and an ISDN link was also going to be very costly. The Vistapoint has proved to be the perfect solution to our problem."

Kevin Tolly and David Newman

LAN VIEWS

Segments, Packets, Fragments and Frames



Graeme Le Roux

There are many things which can adversely affect the throughput of a network; cable problems, insufficient bandwidth and poorly tuned servers and hosts are common examples. One of the less obvious causes of low throughput in networks which combine several different physical layer technologies and protocols is the difference in frame and packet size which the various technologies support. Further complications are introduced by devices such as bridges and routers which cannot cope with the maximum frame sizes supported by a particular physical layer technology's standard. The TCP/IP protocols present several good examples.

Strictly speaking a 'packet' is the basic unit of data transfer in a packet switched network. However, the term has come to be used for just about everything from an MAC-layer data structure — as in an Ethernet packet — to a protocol data structure — as in a TCP/IP packet. Similarly, the term 'frame' has become somewhat confusing. Comms specialists use the term frame in its original context of an electrical signal, while network types use the term to distinguish the physical layer data structure from the protocol encapsulated data it contains — e.g. an Ethernet frame as opposed to an Ethernet packet. Some standards such as X.25 use the term frame to refer to the format of data transferred between a host and a packet switch.

Since I'm a network type I'm going to use the term 'frame' to indicate a bare physical layer structure and 'packet' to indicate a frame which has protocol data in it. A packet's maximum size is limited by the maximum frame size of any particular technology — for example Ethernet has a maximum frame size of 1,526 bytes. The maximum payload of a frame is known as its Maximum Transfer Unit (MTU), which is equal to 1,500 bytes for Ethernet. The MTU of a particular technology can limit the size of a protocol's data structures. The unit of data transfer between two machines in a TCP environment is called a segment.

> *"[in PC environments] the problems of turning large packets into small packets are avoided by simply generating small packets in the first place. The price of this simplistic approach is inefficient use of available bandwidth . . ."*

The Maximum Segment Size (MSS) of a segment is negotiable and is largely dependant upon the size of buffers available to the TCP stack on each machine: however the MSS for intra-LAN use is usually set at a value which will fit into an IP datagram which will equal the size of the available MTU. A default MSS is suggested by the TCP RFIs for inter-LAN traffic. A datagram in an IP environment is the wrapper in which a segment is transmitted, and is a self-contained unit.

This brings us to our first potential problem. Ethernet's MTU is 1,500 bytes, so the maximum size of an IP datagram would be 1,500 bytes on a LAN, which in turn gives a MSS of 1,476 bytes (assuming padding and options). A TCP segment header would then be a further 24 bytes (again assuming padding and options) yielding a maximum data payload of 1,452 bytes. If the average size of the data transfers on your LAN are not integer multiples of 1,452 then you will generate one extra frame per transfer in addition to acknowledgments. But what if your datagram is headed for a destination which is not on the same physical network as its source? If this is the case then the default MSS, 536 bytes, may be used. This generates about 2.5 times the number of packets, even for a simple Ethernet-to-Ethernet transfer. These extra packets can have an impact on the performance of hubs, bridges, routers, etc. but this impact is insignificant compared to what can happen if a datagram must be 'fragmented.' Fragmentation of a datagram occurs when it is passed to a network with an MTU which is smaller than that of the network on which the datagram originated. For example, consider an FDDI packet being passed to an Ethernet; the MTU of an FDDI network is 4,096 bytes, while that of Ethernet is 1,500 bytes — and we are dealing with two separate physical networks. If a machine on the FDDI ring generates a full size IP datagram then that datagram will be fragmented when it is passed over to Ethernet. The result will be 2.5 to 3 times the number of packets on the Ethernet. This is about the same number as in the Ethernet-to-Ethernet situation described above; however in this case the packets are not datagrams, they are fragments of datagrams.

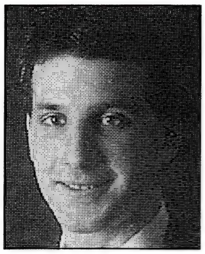
A fragment is not a self contained unit. If a single fragment is lost then the entire datagram is re-transmitted including acknowledgments. This can have a serious impact on the performance of the device connecting the Ethernet and the FDDI networks, which can result in dropped packets. To add to this problem, in an IP environment fragments are only reassembled at their final destination, which in most cases is a workstation. If that workstation does not process incoming packets quickly there is an excellent chance of dropping a fragment. The other side of this particular coin is that sending data from Ethernet to FDDI will result in extremely inefficient use of the FDDI ring's bandwidth — a similar situation to running unbuffered Telnet applications (which generate a TCP/IP packet for each character!) over a Token Ring. Another trap with FDDI-to-Ethernet (and Token Ring) is that some bridges/routers cannot except full size FDDI packets.

It is not unusual to find that the maximum acceptable packet size on the FDDI ring is equivalent to the packet size supported by the device's non-FDDI ports. There are often similar traps with Ethernet-to-Token Ring devices.

The great irony is that in PC environments the problems associated with fragmentation and disparate frame sizes are rarely apparent because the proprietary protocols, and the implementations of standard protocols which are in common use, usually generate packets whose maximum size is between 256 and 512 bytes. In short, the problems of turning large packets into small packets are avoided by simply generating small packets in the first place. The price of this simplistic approach is inefficient use of available bandwidth, particularly in synchronous environments. The only way to contain this waste, and avoid problems of the type I've mentioned above, is a careful analysis of the characteristics of the traffic on your network at a frame level. Pay close attention to such things as the average frame size, average throughput versus frame size of bridges and routers, and characteristics of protocols in use. Armed with this information you can design networks, and applications, to be as efficient as possible.

Graeme Le Roux is a Director of Moresdawn Pty Ltd (Bundanoon, NSW) and specialises in local area network consulting services.

INTERNETWORKING



Wireless Networks: Not So Fast

Eric Hindin

These days wireless networks often end up at the top of those lists compiled by industry gurus about which technologies will soar in the near future. But despite all the accolades, my money says wireless networking will not match its publicity. Peel away all the hype and platitudes, and there just isn't enough left to justify all the attention that wireless technology is getting and no doubt will continue to get.

I first got a funny feeling about wireless networking when it dawned on me that the networking industry's move to wireless is happening at the same time that the television industry, which has relied on the airwaves for decades, is fast moving toward a cabled existence around the world. If the airwaves aren't good enough for Tabloid TV, why would they make sense for computers and critical data? A careful examination reveals that wireless networks are ill-suited for the applications they are intended to serve, from simple messaging to — if the pundits are to be believed — electronic conferencing (Lotus Notes goes wireless). Wireless networks are inefficient in their use of bandwidth; they're too slow, they can't provide enough capacity, they furnish no means to prioritise crucial data, and they are not secure from unauthorised users.

Wireless networks are inefficient in their use of bandwidth because data is sent in all directions, even when it needs to be received at only one point. Even data intended for multiple recipients (broadcast messages) doesn't have to be sent everywhere. I realise this argument isn't often cited as reason not to use wireless networks, perhaps because they still get data to its destination. Then again, a Mack truck could get most of us to work, but we wouldn't use one — it would be too expensive. It also remains to be seen whether polluting the airwaves with data will have health consequences.

> *"Peel away all the hype and platitudes, and there just isn't enough left to justify all the attention that wireless technology is getting . . ."*

In terms of speed, wireless technology as it now exists is an unqualified dud. Tests have revealed that wireless bridges, when linked in close proximity, just about match the speed of wireline remote bridges at 2Mbps-to 3Mbps. At their best, spread-spectrum-based wireless LANs can match 10Mbps Ethernet speeds. As for wireless WANs, service providers boast that they can almost achieve transmission rates of 9.6Kbps — if they use compression. In five years, they may be able to jack up that rate to 19.2Kbps, assuming that CDPD (Cellular Digital Packet Data), a new technology that enhances the cellular network, is put in place (see 'Taking a New Look at Mobile Data,' in the September 1993 issue).

None of these speeds seem good enough. Where are wire-based LAN and WAN technologies going to be five years from now? How will spread spectrum measure up once Fast Ethernet, full-duplex switched Ethernet, ATM and the like are in place? As for the WAN side, isn't the big knock on ISDN that at 64Kbps it's too slow to interconnect LAN applications?

Even for applications now served by dial-up modems, such as PC file transfers and electronic mail (the applications that many take as givens for wireless networks), wireless WAN speeds are marginally adequate at best. Users crave speed — they're whining because the ITU-T is taking its time approving the V.34 (also known as V.fast) specification for 28.8Kbps communications, and some Windows users are already grumbling because the Microsoft operating environment may not be able to provide reliable asynchronous communications above 36Kbps.

Now about capacity: if you think today's wire-based WANs are straining under a heavy data load, wait until cellular phone networks try to carry corporate bits and bytes. As anyone who uses a mobile regularly knows, cellular networks are having a hard time just meeting service demand for voice calls. Sure, there are digital networks now springing up, but even the rosiest predications put them well short of handling the kind of traffic that airborne applications would generate. There simply aren't enough megahertz or gigahertz to handle full-blown wireless networks.

For argument's sake, let's assume that network managers are willing to put up with low speeds and bandwidth to gain the benefits of wire-free networking. There still are a host of software-related issues that need to be resolved. Most of these concern features that often are taken for granted in wire-based LANs and internetworks.

One of these is traffic prioritisation. Net managers who have built router-based internetworks know that traffic must be prioritised so that congestion doesn't block critical data. Router software can handle this task. It probably won't be able to prioritise data over the airwaves, since wireless transmitters have virtually no control over the ability of remote wireless users to gain access to the public cellular network in regions where bandwidth is at a premium.

And if you think disgruntled employees, hackers, software viruses, or corporate spies are a problem now, wait until your data's shooting through the ether at light speed. As TV broadcasters know all too well, the airwaves are fair game for piracy.

The solution to the wireless network security problem is to equip each wireless device with encryption software. US TV broadcasters are pursuing this measure; they have begun scrambling signals to foil satellite dish owners. But encryption schemes cost money. Anyone like to guess what it would cost to implement encryption on every laptop, personal digital assistant (PDA), and workstation equipped for wireless transmissions?

And then there's that other issue that has bedeviled users for years: standardisation. PDA developers aren't close to agreeing on a common operating system, application program interfaces, or communications protocols. Without these, interoperability won't happen. The same holds for vendors of wireless bridges and providers of WAN services.

All this is not to say that wireless communications won't ever happen. Wireless is neat and tidy — no messy wires or cables to trip over or clog up building arteries. And it offers the illusion of freedom: instead of spending 12 hours a day chained to the corporate network, we can take our portables and toil away wherever we want. But full-blown wireless applications aren't going to happen anytime soon. At best, wireless networks will remain a niche application. A more likely scenario is that, for the near future, the market will fall with a resounding thud. My advice is to steer clear of wireless networks unless you have specific applications that won't require lots of bandwidth or 100% reliability.

Eric Hindin is Senior Technology Writer for Data Communications magazine, based in Boston.

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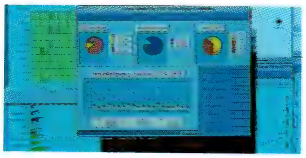

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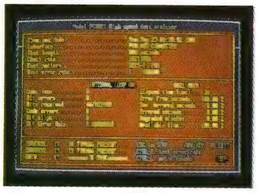

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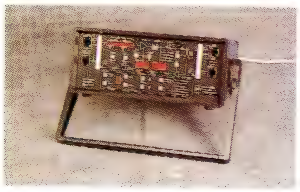

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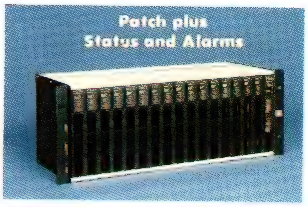

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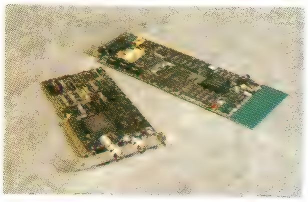

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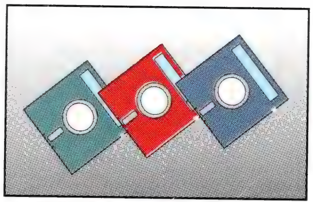

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Drag and Drop Your Host Data

Wall Data's Rumba Office lets network managers tightly integrate desktop applications with data from multiple hosts.

Many companies are grappling with ways to grant their PC users easier access to legacy systems and to more tightly integrate host data with shrink-wrapped desktop applications. Until now, terminal emulation software has been the only game in town. But the trouble with this method is that users require separate emulation packages for each host they need to connect with. And bringing host data into applications usually entails a pad and pencil.

Wall Data has addressed these problems with its Rumba Office. The package is one of several gateway products now on the market offering a way into different kinds of hosts (IBM mainframes, AS/400s, RS/6000s running AIX, DEC VAXes, and Unix). But it goes beyond the competition in a big way: the vendor plans to bundle APIs into the package that will let users capture all that host data and bring it back into their PC applications via Windows, something that was not possible before.

Further, Rumba Office makes it easier to develop client-server applications because it supports IBM's APPC client-server networking technology.

Beyond the Basics

All of these capabilities catapult Rumba Office out of the territory covered by conventional terminal emulation packages, which let users run host applications from a PC but don't let them manipulate host data. End-users will see a big difference between Rumba and emulators: with Wall Data's product they can capture host data to a program running under Windows and work on it with a tool they're already familiar with.

Rumba Office includes a batch file-transfer feature that could be a real time-saver. It lets users tag multiple files, as they would within Windows' File Manager, then drag and drop them into a Rumba session. In contrast, emulation packages typically require users to transfer files one by one.

Rumba's support of APPC means that any PC running the package can gain access to any APPC application in an SAA (Systems Application Architecture) network and act as an APPN End Node. What's more, the software supports IBM's CPI-C (Common Programming Interface for Communications), which is quickly becoming a common architecture for writing new mainframe applications.

Rumba Office runs APPC as a native Windows application, enabling PCs to operate as a PU2.1 (Physical Unit Type 2.1) Low Entry Networking Node. This means that PC users can now be full participants in APPN networks, receiving data routed via the net and having the ability to communicate with APPN Network Nodes.

The product will enable users to port established APPC applications into Windows. Further, APPC applications running on different PCs can interact via Rumba sessions, sidestepping the host. This offloads transaction processing duties to the PC, conserving host processing cycles.

To furnish users with this level of connectivity, Wall Data has teamed up with IBM to give Rumba a way to work with IBM's DRDA (Distributed Relational Database Architecture). Rumba runs DRDA on top of APPC. The APPC-DRDA link gives users easier access to host data. On the client side, Wall Data will link Microsoft's ODBC (Open Database Connectivity) protocol with DRDA, providing a way to link desktop applications to back-end databases. Net managers can then create customised applications that funnel data from databases and multiple hosts into a desktop application.

Rumba Office can also help preserve application development resources. In the past, programs that let PCs grab hold of host data have either been developed from the host or PC side. There are two significant drawbacks to the host-based approach. It is time-consuming, but more importantly, it often fails, because the code often is written by a third party not familiar with the business environment that the application is destined for. The PC-based approach hasn't worked ideally either. PC applications developers soon find themselves in unfamiliar territory when called on to write code to summon host resources. Rumba Office enables these developers to work in their own realm, since they can channel data from the host into programs that they have authored.

The messaging and database APIs bundled with Rumba Office were either developed in-house or made possible via partnerships and acquisitions. The messaging APIs include a program that will direct a Rumba mail session to act as a back-end for IBM's Profs or DEC's All-in-One package. Additionally, the messaging APIs will tie into X.400 or MAPI products.

Salvatore Salamone

PRODUCT SUMMARY

Name: Rumba Office

Description: A software package that gives users access to mainframes, AS/400s, VAXes and Unix hosts from an IBM or compatible 386 or higher PC

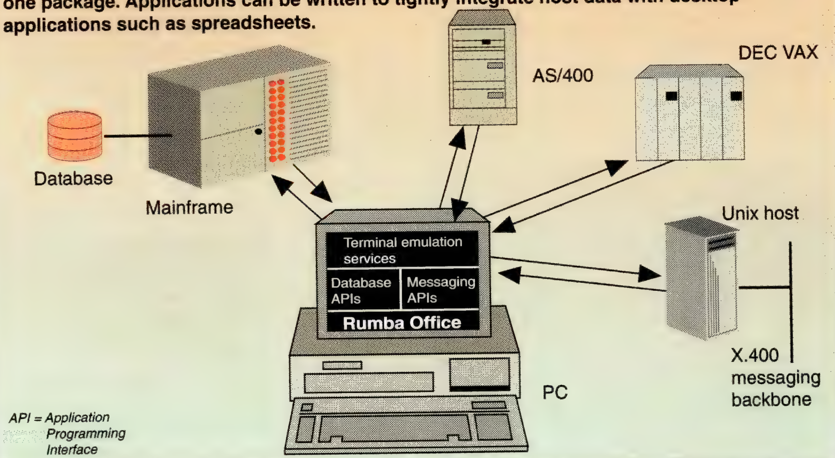
Price: Around $750

Vendor: Wall Data

Distributors: Datacraft, 266 Maroondah Hwy, Mooroolbark VIC 3138 Tel: (03) 727 9111; Rosser Communications, Suite 3, 6 West St, Pymble NSW 2073 Tel: (02) 418 2544

An All-in-One Integration Tool

Rumba Office gives PC users access to resources residing on several different hosts from one package. Applications can be written to tightly integrate host data with desktop applications such as spreadsheets.



Opening ISDN Gateways

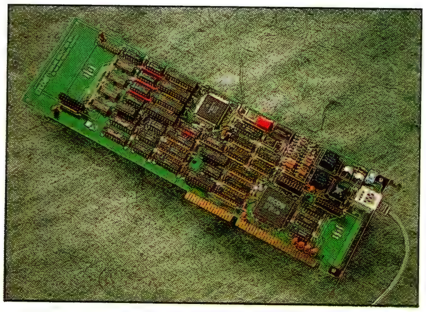
Used in conjunction with gateway and router software, the new EiconCard ISDN/PC adaptor provides PC users with ISDN connectivity.

By world standards one of the eccentricities of the Australian IT landscape is the number and size of WANs built around IBM's SNA — from banks and financial institutions at one end of the scale, to AS/400s, and in some cases older System/3X machines, at the other. And as the owners of these installations have moved from terminals to LANs Australia has consequently become a large consumer of SNA gateways.

But many EDP managers initially resisted the deployment of PC-based SNA gateways for the best of operational reasons — typically lack of reliability due to poor emulation of necessary control functions. However gateways cost much less than traditional solutions and can be more flexible and so their use has continued to increase. The cynicism of EDP personnel towards gateways has fuelled a process of natural selection which has resulted, for the most part, in the departure from the Australian market of those vendors who have produced less than perfect emulations, been unwilling to correct or improve their emulation of management functions or who have failed to recognise their market's de facto standards.

These faults have never been characteristic of Canadian-based Eicon Technology. Eicon is known for its SNA gateways and, to a slightly lesser extent, for its X.25 gateways. The company also produces a software-based router for Novell NetWare which supports versions 3.11 and later. With the release of its ISDN/PC adaptor Eicon intends to make its gateways an even more cost effective solution and to provide its customers with a range of communications alternatives without making current applications built on the company's existing gateway products obsolete overnight.

All of Eicon's gateways are built in layers which are roughly analogous to the OSI model. At the bottom of this 'cake' are what Eicon refers to as 'diallers.' These diallers manage all Eicon's hardware product functions. The new ISDN/PC card, along with its optional High Speed Interface (HSI) and compression module is simply presented as one more dialler which is automatically supported by all Eicon's existing software offerings and all user applications written using Eicon's software tool kits and the API sets which they support.



Optional Compression

The ISDN/PC adaptor itself is a 16-bit ISA full length card on which is mounted a 68302 processor running at 16MHz with 2 MBytes of RAM. This processor is responsible for a good deal of the low level processing which would otherwise slow its host significantly. The card supports all the standard ISDN features such as multipoint operation (including class priority on the D channel), service profile identifiers, local and remote directory numbers, local sub-addresses, etc. The card's physical ISDN connection is an RJ-45 connector providing a standard BRI S/T interface.

The optional HSI, which is physically a daughter board, is capable of supporting V.24 (RS-232C and X.21*bis*), X.21 and V.35 interfaces via a DB-26 connector at line speeds of up to 384Kbps. This option provides an excellent solution for sites in areas where ISDN is not currently available but will be within a reasonable time or a where legacy equipment (say at head office) requires that a standard DDN link be retained during a transition period. The HSI also provides a useful alternative for a low bandwidth backup link. Though this would probably not be delivered as a redundant path, it would circumvent problems with ISDN hardware such as an NT-1.

The HSI and ISDN's 2B + D channels are presented as logical ports to higher level software, and one or more ISDN channels can be aggregated to a single port, which may be assigned to support a variety of OSI and SNA protocols such as QLLC/X.25, SNA/SDLC, frame relay and PPP.

Another interesting feature of Eicon's ISDN/PC is the optional compression module which is, like the HSI, a daughter board. This module supports an implementation of the Lempel-Ziv algorithm and can provide compression ratios of 4:1. Unfortunately this is a proprietary implementation and therefore it requires an Eicon card at both ends of the link; however in the light of a possible 256Kbps over a single 64Kbps B channel this is very little burden. It is unlikely that too many administrators of, for example, NetWare LANs, would turn down a server-based router capable of up to 512-Kbps — with little impact on the server — just because it used a proprietary compression algorithm. Similarly I doubt that many EDP managers would ignore the possibilities of such a link because it involved using a 'PC gateway' on a 'PC LAN' for a pair of hosts to communicate.

PRODUCT SUMMARY

Name: EiconCard ISDN/PC Card

Description: ISDN basic rate adaptor for PCs and file servers

Price: EiconCard ISDN/PC $2,200 (excludes gateway software). Eicon Gateway and/or router software from $350

Vendor: Eicon Australia

Distributors: Com Tech Unit 5, 37-41 Doody St, Alexandria NSW 2015 Tel: (02) 317-3088; JNA Network Services, 16 Smith St, Chatswood Tel: (02) 417-6177

Used with Eicon's gateways, the EiconCards are not restricted to simple connection of PCs to hosts, but can act as network-to-network gateways in every sense and can provide a very cost effective solution to host-to-host connectivity problems, particularly in a small to mid-size APPC environment where more traditional solutions may prove uncomfortably expensive.

In summary, the EiconCard ISDN/PC represents an evolutionary step in Eicon's hardware technology which will fill a very broad niche in Australia. The product can be applied now in many large banks, building societies and other large institutions which have numerous small branches which require cost effective data-only communications. It can be applied in areas where ISDN exists, or where ISDN will exist in an acceptable time frame, it can be applied in existing Eicon installations and most important of all it can be used without fear of disrupting existing SNA applications running over existing Eicon gateways. It should also be noted that users wishing to develop applications may develop them on any convenient Eicon platform using Eicon's tool kits and, because of Eicon's layered software architecture, be confident that their application will work on the new ISDN card.

Graeme Le Roux

A Speedy Solution Until V.fast

With its new V.fast Class Optima 288 modem, Hayes gives users effective data throughput as high as 230.4Kbps.

While the data comms industry eagerly waits for the V.fast high-speed modem standard to emerge from committee, a throng of vendors has rallied in support of an interim solution called V.fast Class. Hayes is one of the first out of the gate with a device that complies with the de facto spec: the Optima 288 Data/Fax modem.

The Optima operates at up to 28.8Kbps, the top speed stipulated by V.fast Class. What sets it apart from the handful of rival boxes that have made it to market is its enhanced version of V.42*bis* data compression that can boost compression to 8:1 — yielding a throughput as high as 230.4Kbps.

Under normal conditions most users wouldn't be able to benefit from the Optima's top speed because of the 115Kbps limit of the UART (universal asynchronous receiver/transmitter) chip on their PC's serial port. But Hayes has alleviated this traffic jam with an enhanced serial port card, called the ESP Communications Accelerator, that allows the modem to run full speed on any ISA-bus PC. The Optima also features automatic data synchronisation to convert async terminal and FEP (front-end processor) data into sync traffic, allowing PC-to-mainframe connections at up to 28.8Kbps.

Users should be aware that a serious problem could crop up on PCs running Windows 3.1. Hayes warns that setting the serial port rates higher than 57.6Kbps might crash the system, but adds that this calamity can be prevented if users deploy the ESP board together with their V.fast Class modem.

But Will They Agree?

Whether the ratified V.fast spec will closely resemble the de facto standard is anyone's guess. (The ITU-T is expected to publish V.fast in mid-1994.) A groundswell of modem makers, including NetComm, General Datacomm, and Hayes, are confident enough in the stability of V.fast Class to release products based on it.

Two key technical issues remain on the table before V.fast is a wrap. The first is the pre-coding schemes for data and fax. The second is the modulation method for half-duplex fax transmissions.

The de facto standard is expected to be forward-compatible with V.fast. All of the vendors that have released V.fast Class modems say they will offer upgrades to V.fast. But the modem makers are uncertain whether modifications will be software-only or if they will entail a board swap. The extent of the upgrade will depend on how much the V.fast and the interim technology differ.

While end-users may know that V.fast Class modems will give their data transmissions a speed boost, they may be perplexed about how the popular 14.4Kbps V.32*bis* standard and 19.2Kbps V.32terbo (the first V.fast stand-in) figure into the de facto spec's development. The answer is that V.fast Class chips implement V.32*bis* modulation but leave out V.32terbo (it doesn't mesh with V.fast Class).

Adding to the confusion is the fact the V.fast Class is a broad implementation based on three different Rockwell International chip sets that all operate at different speeds (19.2Kbps, 24.4Kbps and 28.8Kbps). Vendors can design their modems to run at any of the three speeds and still claim V.fast Class compatibility.

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PRODUCT SUMMARY

Name: Hayes Optima 288 V.fast Class Data/Fax modem

Description: One of the first modems to incorporate the de facto V.fast Class standard

Price: The Optima 288 modem costs $1,500. The ESP Communications Accelerator is available for $195

Vendor: Hayes Microcomputer Products

Distributor: MPA International Pty Ltd,
51 Lusher Rd, Croydon VIC 3136
Tel: (03) 724 4444.

In order to create modems able to push traffic across the wire as fast as 230.4Kbps, Hayes tweaked the hardware and software that carries the V.42*bis* compression algorithm. The catch to the Hayes' scheme is that, to take advantage of the Optima's best throughput, modems must be deployed in pairs. Moreover, the usefulness of Hayes' 8:1 mode depends on the type of traffic users send. For instance, graphics files contain much repetitive information and thus can be greatly compressed. But precompressed files and executable program files can't be crunched much further by modems and typically will travel at speeds of between 30Kbps and 50Kbps.

As noted, even when sending highly compressible files, the Optima's 230.4Kbps rates aren't feasible for most PCs as a result of their UART's speed limitation. To overcome this barrier, Hayes developed the ESP Communications Accelerator serial port ($195), an add-in card for 16-bit ISA-bus PCs that supplants the UART chip. The ESP board can keep up with the Optima's top speeds.

The secret to how the ESP breaks the UART speed limit is simple — more buffering. Hayes' alternative serial port boasts a whopping 1,024-byte memory buffer on both the sending and receiving sides, greatly reducing processor interrupts and thus increasing throughput. Hayes says that the ESP accelerator board can easily accommodate 230.4Kbps today with plenty of room to handle faster modems in the future.

Barry Phillips

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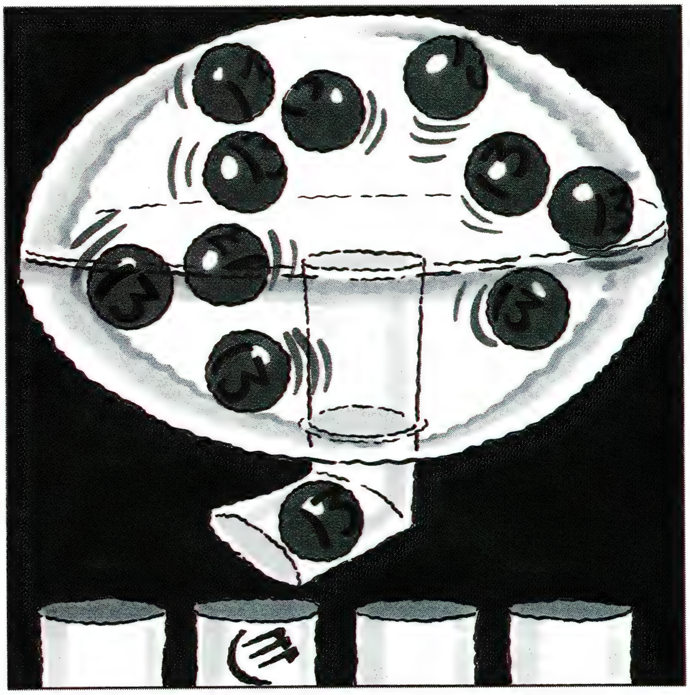
'13' Services — Optus' Lucky Number Comes Up

Austel recently ruled in Optus' favour in a dispute with Telecom over Optus' competing service to CustomNet 13. Peter Waters reviews the arbitration and its consequences.

The '13' number range is for services that impose a low charge or impose no charge on the calling party, or the 'A-party.' The main call charge is borne by the called party or the 'B-party.' Currently only offered by Telecom, 13 services are used by many large businesses, such as banks, airlines and insurance services, to establish nationwide customer service numbers (e.g. Ansett's reservation service is 13 13 00).

The 13 service is driven by a carrier database that determines where to route calls in accordance with the B-party's instructions. This allows a business with multiple premises throughout Australia to determine where calls will be handled within its organisation depending on the location of the calling party or other factors such as busyness at particular offices or time of day. All of this is transparent to the A-party. This means that the same 13 number can be promoted by a business throughout Australia and can be used by A-parties to make calls which may be local calls or long distance calls, without the A-party knowing which it is.



In this respect, a 13 service is similar to a '008' service, but it has two big advantages. First, to date the new 13 range has been limited to six-digit numbers, providing a more memorable number length for customers. Some companies have paid a significant premium for particular six-digit 13 numbers, so-called vanity numbers. Second, 13 has a very different charging structure to 008. All calls to 008 numbers are free to the A-party; the B-party pays a timed charge for each and every call, including local calls. This is why many businesses place a metro-bar on their 008 services, and require locally situated customers to call the company's ordinary number.

With 13 services, the A-party pays a local call charge for all 13 calls, whether local or long distance, and the B-party only pays for long distance calls. Given that many calls will be from metropolitan areas where the B-party probably has an office, a large volume of calls can be local calls, representing a potentially large saving to businesses who use 13 instead of 008.

So, why aren't businesses leaving 008 in droves for 13? Because of the limited number ranges, a high premium is extracted by Telecom, putting the option beyond the reach of most smaller and medium sized businesses. Optus saw an opportunity to offer a more competitively priced alternative to the existing Telecom service. Austel's numbering advisory service also had recommended that the 13 range be extended to include an eight digit service ('13 XXX XXX'). While less memorable than the existing six digit service, the greater number availability provided the opportunity to introduce a much cheaper 13 service that would bring the unique 13 charging structure (i.e. no B-party charges for local calls) within the range of more businesses.

What's the Problem?

The interconnection arrangements for the Optus 13 services presented unique issues that do not arise in relation to the standard 'Dial 1' or preselected long distance calls. With these latter services, the A-party makes the decision about which carrier to use, and the call is metered and billed by that carrier's own system. However, with 13 calls, the B-party is the one who chooses whether the service is to be provided by Optus or Telecom. By dialling the B-party's 13 number, the A-party's call is carried, without any choice by the A-party, by the carrier that the B-party has chosen. In other words, the choice of carrier is made in the reverse direction to that which applies to a normal long distance call.

The second problem is that the ability to meter and bill the A-party charge is a critical ingredient to the 13 call. For its existing 13 services, Telecom uses its local call metering system, which logs the 13 call in the same manner as a local telephone call. The charge to the A-party is included in with the customer's local call charges. While Optus could measure and bill the long distance call component charged to the B-party, Optus faced significant difficulties in measuring and billing the A-party charges from directly connected Telecom customers because it did not have a local call metering and billing system.

Who's Whose Customer?

The heart of the dispute was whether the A-party making a 13 call to an Optus service was a Telecom customer or an Optus customer. This determined which carrier was entitled to bill and keep the critical A-party charge.

The answer lay buried in the sometimes obscure theories of interconnection. Most Optus long distance calls involve carriage over the interconnected networks of the carriers. Telecom, as the carrier that directly connects most customers, provides 'access services' to Optus to carry calls from customers who have selected Optus. Thus, even though the A-party is Telecom's customer for the provision of the telephone line, Optus, as the interconnecting carrier, is the provider of the long distance service to the customer, and Telecom as the access carrier, is the provider of originating and terminating services to Optus.

Telecom argued this model should not apply to calls to Optus 13 services. Rather, the A-party was still a Telecom customer for a local access service. The customer, in effect, was placing a local call to the Optus 13 database in much the same way as calling any other person where the A-party was charged $0.25. The carriage of the call from the Optus database to the B-party was a separate Optus service provided to the B-party by Optus. Telecom argued that customers clearly regarded 13 calls as local calls, noting that 80% of 13 calls were local. The call was included in the customer's local call charges undistinguished from any other local call. Therefore, the $0.25 cents A-party charge rightfully belonged to Telecom.

In Optus' view, a call to an Optus 13 service was a single, unsegmented end-to-end call provided by Optus between the A and the B-party. Optus asserted that Telecom's characterisation artificially divided what is a single call into two separate calls (i.e. from the A-party to the Optus database and the second call from there to the B-party). Telecom was no more providing a local access service to the A-party than it was in the case of an Optus long distance call: the local access was not being provided by Telecom to the A-party but rather to Optus as an access service. Optus argued it was irrelevant that the A-party did not choose between the carriers for the carriage of the 13 call because the B-party, as the party establishing the 13 service, was the real customer.

Optus asserted that under Telecom's model Optus would have no choice but to collect from the B-party the charges that the A-party otherwise would meet. This, in effect, would mean that any Optus 13 services would be little different to 008 and only Telecom would be in the position of being able to continue to offer B-parties the unique call structure of offsetting local call charges through an A-party charge.

Billing

Even if it was successful in getting its interconnect model recognised, Optus faced a second hurdle in the billing arrangements for the $0.25 charge. As noted, Telecom rolls the charge into the A-party's local call charges. Optus said that the only commercially viable solution was for Telecom to bill as Optus' agent the A-party charge for calls to Optus 13 services. Optus argued that it would not be economical for Optus to send out separate bills to customers who called its 13 services as most customers only made a few calls to these types of services each year and, therefore, the administrative costs associated with the billing would soon outweigh the small call charges.

Optus noted that while it could include the $0.25 charge in the bills of customers to whom it was otherwise billing because they were Optus long distance users, the attractiveness of 13 services to B-parties critically depended on universal A-party access: that is, all telephone users had to be able to call the B-parties to whom Optus provided 13 services even if those users were not ordinarily Optus customers for long distance services. Optus also noted that in order to bill the A-party charge, it needed calling line identification information and this was not universally available yet from Telecom, and was another barrier to universal availability of the Optus service.

Telecom hotly disputed that it was under any legal obligation to provide billing services to Optus. Telecom pointed out that while section 138 gave billing services as an example of the types of supplementary access services which could be prescribed under the Carrier Licences, this had not been done in the licences. Telecom disagreed with Optus that Telecom's licence condition requiring access to 'facilities' could be read as reaching beyond sharing of physical plant like pits, poles and conduits. Telecom said that as a matter of general principle each carrier should bill its own services, and that it was confusing for customers to include Optus charges in a Telecom bill. Also, because the Telecom local call metering system does not allow itemisation of calls, it would not be possible in the Telecom bill to identify Optus 13 calls separately from Telecom local calls, and that this contravened the customer's basic right to know for what he or she was being charged. Finally, as all calls metered on Telecom's local call system had to be metered at the same rate, this would mean that the Optus A-party charge had to be tied automatically to the Telecom local call charge, which was anti-competitive and would cause a nightmare with special services like the extended untimed local call area.

Austel's Ruling

Austel's starting point was that competition should be introduced for 13 services if possible. Austel accepted Optus' arguments that adoption of the Telecom interconnect model and any requirement on Optus to bill A-party charges, in practice, would mean that Optus could not offer 13 services. However, Austel also appears to have been concerned with some of the difficulties and issues which Telecom raised.

Austel, therefore, opted for the Optus model on interconnect and agency billing by Telecom but 'as an interim solution only, pending the development of a model that will cater for the more sophisticated services of the kind under consideration.' Austel noted that the 'interim model at this stage will enable Optus to get a foot in the door . . .', and that the carriers under Austel's guidance would proceed to develop a more enduring model, including to accommodate the changed environment after 1997. It was also noted that at least one of the justifications for the interim requirement that Telecom bill for Optus — lack of full CLI availability — would be solved by 1997 because Telecom was under a licence obligation to upgrade its network by that stage. However, Austel also noted other factors justifying the billing agency services, such as the cost of Optus billing, which would still apply presumably after 1997.

Finally, Austel also noted that there was some doubt as to whether Telecom was under a legal obligation to provide Optus billing services, but Austel said that it would request the Minister to amend the licences to clarify this issue.

Conclusion

B-party-pays services, like 13, are likely to experience dramatic growth in the near term. AT&T estimates that nearly half of the traffic carried over its network in the US is B-party-pays. The Austel decision will allow competition in the full range of B-party pays services, including speeding the introduction of cheaper 13 alternatives to the current premium service. While only an interim solution has emerged from this arbitration, it also represents the next step in developing interconnect models to handle the evolution of the provision of intelligent network services across the interconnected carrier network platform. However, as future interconnect negotiations doubtless will reveal, there is still a long way to go on these issues.

Peter Waters is a Partner at Gilbert & Tobin, specialising in technology and telecommunications. The author was involved in the arbitration on Optus' behalf. This column sets out his personal views and not those of the firm or its clients.

HEWLETT®
PACKARD

Uncovering network problems one segment at a time could leave you open to some unpleasant suprises...

Hewlett Packard Network Management

"It's easy to be wise after the event — but being wised up before it happens, is the trick."

This should be the motto of the network managing profession — along with "Life wasn't meant to be easy!"

As our networks grow through the rest of this decade and, as they increasingly extend geographically and include different types and makes of equipment, our ability to manage them in the time-honoured >post-hoc< fashion is going to disappear. We really need to predict problems before they are disruptive.

This economic 'evolutionary' reality is inherent in the exponential growth in complexity that we are all facing. And with corporate mergers, IT downsizing, and client-server architectures, the problems will only get worse: these days, more than half all PCs sold are being connected to networks. This power-to-the-desktop trend has diffused the company's most vital information throughout the organisation, and so increased corporate reliance on managing and maintaining the networks themselves.

Communications managers now need to deal with a range of LANs, wide-area networks (WANs), and often global internets. And the profitability of corporations is increasingly tied to the viability and efficiency of its private communications. So communications managers increasingly work 'under the gun' — they are held accountable for the availability of the network to their organisation because the network must be maintained at 'all cost'.

Perhaps the 'all cost' factor exists in theory, only. In practice it's more likely to be "at all cost, but don't exceed your budget!". But common sense indicates that proactive expenditure in vital resources, such as networks, can be the most effective expenditure a network manager can make.

As Robert Wallace, Hewlett-Packard's Test and Measurement Data Communications Consultant points out, "The bottom line that a network manager has to face, is defined by the two questions: 'If I invest $100,000 in management and monitoring equipment, will it pay off?' and 'If my network goes down for half-an-hour, what does it cost?.'"

A recent study by Infonetics, Inc. of Fortune 1000 companies in the States revealed the cost of a LAN failure was US$30,000 an hour and the network was, on average, out for 4.9 hours. Of the companies studied, the mean annual loss of revenues due to network disability was aboutUS$606,000.

So the communications manager is faced with the problem of deciding how important management and monitoring equipment is to his organisation; and predicting how the cost of this capital outlay will compare with revenues lost if (or when!) his network goes down. This is a question that can only be answered from within the corporation, but it is clear that for many organisations the cost of network management tools is trivial when viewed in the corporate context.

So growing network complexity increases the load on communications managers, but on the positive side of this equation, MIS directors are also now being elevated to director level because these networks are now such a mission-critical component in the corporate business plan.

To succeed in today's competitive world, corporations must have real-time communications systems which are able to deliver corporate data to sales offices, find and present data about competitors and their products, distribute delivery schedules, and provide information to branch offices about corporate capabilities. And these companies are all fighting in the same market-place as competitors who have similar networking goals. Both the network and the network manager have achieved a new status in this environment.

Large, medium and even the smallest of corporations now use LANs, WANs and/or MANs, and these company resources are now as fundamental as the telephone. And most companies have hardware and software stocks chosen by the time-honoured marriage-vows selection process — "something old, something new, something borrowed, something blue." The legacies of the past present problems we must learn to deal with.

So equipment must be on-hand to deal with a range of vendor equipment, and efficient network management and planned trouble-shooting procedures, are essential to bring information and resources back under control. Centralised, distributed and hand-held test products are needed to elicit vital information when problems arise, and companies need to spend the time and money necessary to build expertise and put management and monitoring tools in place before problems arise.

Fortunately recent changes in the range of networking options are not all costly or troublesome from the viewpoint of network management. The technical advancements in both hardware and software which have bred this new network complexity, also provide the foundations for improved management tools.

- Faster and more powerful workstations and servers have been matched by better and more intelligent LAN-monitoring probes and protocol analysers.
- The distribution of information resources throughout the network has been balanced by the development of centralised network analysis monitoring systems. This has allowed more efficient use to be made of skilled human resources.

- Radical reductions in the price of memory and microprocessors for servers and terminal equipment, has also meant lower-costs probes, analysers and central consoles.

But not all network problems are amenable to centralised management and control — and you can't have multi-skilled experts resident at each site on 24 hour-a-day rosters. But, unfortunately, its a fact of life that between 50 and 80 percent of all network segment failures are caused by physical faults in the cabling — and these obviously can't be rectified by commands across a network.

Media Test

The solution must be found in Media Test tools which even a semi-skilled local technician can use. And for sophisticated testing, these devices must be reasonably intelligent, and have modular functions which can be added in special circumstances. The physical testing of copper wires and fibre optics needs quite different Media Test tools. But in both cases these are hand-held units which don't report back, and need to be used on location by the technician. Alan Brown, a data communications expert in HP's Test & Measurement Organisation points out, "These are as fundamental in any local LAN toolkit, as a multimeter would be to an electrician."

HP's Cable Test Set and FDDIport both fit into this category. With the Cable Test Set, installers and technicians can quickly certify cabling systems for Ethernet, 10 Base-T, token-ring and E1 networks, and they can quickly isolate the most common faults in cabling systems using time-domain reflectometry. Signal attenuation and cross talk measurements can be performed over the range from 256kHz to 20MHz.

The FDDIport checks fibre networks at FDDI data-rates, and it can also test FDDI-over-copper (CDDI). It performs protocol verification, link error-rate tests, and conformance tests.

To reduce training requirements, and increase functionality to semi-skilled technicians, the autotest feature of the Cable Test Set automatically selects and runs the appropriate measurements for a specific cabling system. And since it reports on the basis of deviation-from-expected results, it can be operated by almost anyone. When coupled with an optional Cable Management System, the Test Set has access to a database containing up-to-date records of the physical parameters of every part of the cable system — a baseline inventory against which future measurements can be compared.

FDDIport has similar automated test sequences through its optional Advanced Network Test Centre suite, and so it is also able to do both manual or automated tests. It can perform both non-intrusive and insertion testing. All test results are captured and presented on a scrollable 32 character LCD display: so hundreds of test results can be stored in the internal non-volatile memory and later downloaded through the RS-232 port for additional analysis.

Although the FDDIport was designed as a small hand-held portable stand-alone unit, it can be attached to a network segment as a MAC-less node, where it acts (transparently) as a monitor. This feature is useful to check segments with intermittent problems.

The Strategic View

But the management of any large network requires much more information than this; we need to have a strategic distributed view of the whole network on a segment-by-segment basis and this can only be obtained from agents (both hardware and software) embedded in the network at key sites.

Hewlett Packard provides data collectors/samplers which can be placed in various segments of the network to monitor traffic and inform management when problems arise. These devices collect statistical information on the traffic, and can report or issue alarms automatically, or be interrogated by a central console for its information.

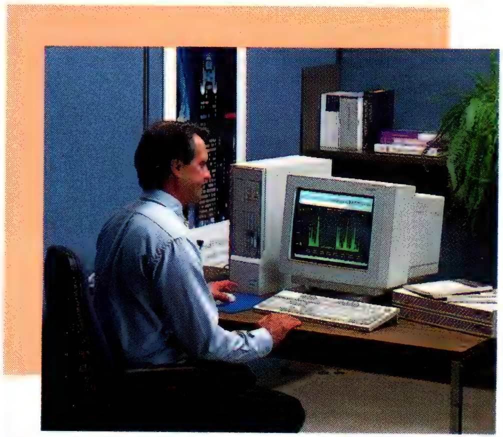
The main tools available here are LanProbes (hardware) and the new HP NetMetrix software 'power agents' (on a workstation) which perform a very similar function. With EASE (HP's Embedded Advanced Sampling Environment) data-sampling features are also being added to hubs, bridges and routers, to perform some of the functions of these stand-alone management and monitoring devices. EASE essentially turns HP hubs and bridges into intelligent instrumentation devices. This instrumentation samples the network and gathers key information to help analyse network performance.

All of these HP devices can report locally, or be embedded in the network and report back to a central console. This provides the network manager with the ability to make strategic decisions. From his central console, the network manager can communicate to a remote LanProbe or power agent by using SNMP (Simple Network Management Protocol), which is now the leading industry-standard method of providing two-way communications between devices.

Robert Wallace of Hewlett-Packard's Test and Measurement Organisation explains: "The reason why this process is classed as 'strategic' is that it can provide information about various parts of the network and allow the network manager to make a wide range of major structural decisions, quite apart from simple fault-finding. For instance if a remote segment has a heavy traffic load approaching its limit, the manager can make strategic configuration decisions, and prevent the problems before they arise."

To make these decisions effectively, the manager needs to see the entire network, rather than just view it on a segment by segment basis. By using the performance information collected by this distributed system, the manager can decide to grow his network, and he can communicate his findings higher up in the company, so upper-management can appreciate the need to invest more in equipment, to increase capacity, or to move people around.

Distributed Monitors



"We put these low-cost pieces of hardware or software out in the network and they are all tied back to a central-site computer or workstation that has the applications required to decipher the information," explains Wallace. "The central unit will be running HP's Probe Manager, or the Load Monitor, Traffic Generator or any of the other HP NetMetrix applications. They make relevantinformation available at the console through graphical means — through performance graphs or alarm frameworks — so the network manager has an easy-to-understand global view of his network in this distributed mode."

In the past decade there's been an emphasis on establishing communications and management standards which carry across the equipment from the various vendors — and, what's more, there's a growing adherence to these standards — so there's some easing of the problem of integrating hardware and software platforms. As ATUG found in its recent Network Management Study, "In about 10 years, these [SNA, DECnet and other proprietary] networks are likely to merge to a common protocol, so that, for example, some users may run SNA protocols over OSI networks."

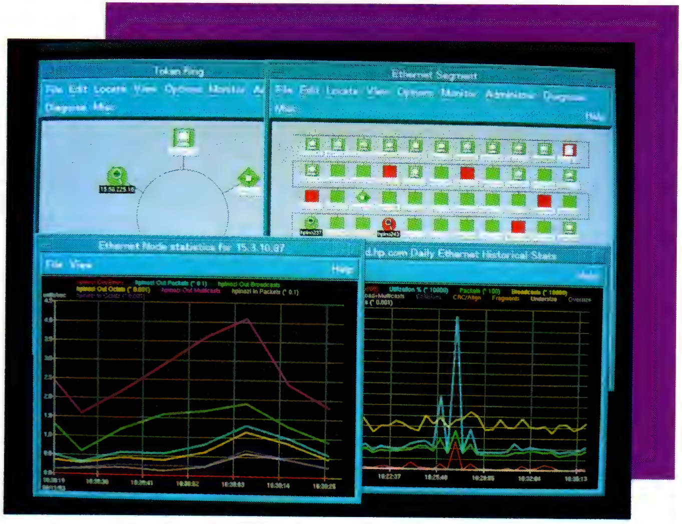
"OSI is expected to be the dominant protocol in the 10 year time frame, although it is expected that there will still be substantial TCP/IP networks [in use] at that time," they concluded.

But that doesn't help much in the interim. Most of the companies ATUG surveyed still had: "a mixture of various sub-networks, including voice, host-base systems, LAN structures, LAN interconnect /WAN components, packet-switched architectures, a wide variety of public network telecommunications services, and in some cases, private radio or infra-red links."

"But a lot of the network management systems can only run on IP," explains Alan Brown, "so if the network is not running IP, the manager needs to have access to a number of other third-party application packages. LanProbe and all HP's monitoring systems are multi-vendor distributed management tools. It doesn't matter what protocol you are running out there, the LanProbe can analyse the data flowing through that network and do statistical graphs and monitoring."

Dedicated data collectors like HP's LanProbe II/SNMP are turnkey solutions with excellent performance and error monitoring capabilities for both Ethernet and Token Ring topologies, and they can report back to HP's OpenView environment — based on either Unix or MS-DOS workstations.

"ProbeView is a version of the monitoring software application which can run on any 386 or 486 DOS PC, so you don't need to buy special equipment if your budget doesn't justify the extra expense," Brown explains. "Then you can pull the information back to one site and do a graphic analysis on the whole traffic flow."


Token Ring
Ethernet Segment
Ethernet Node statistics for 15.3.10.87
Daily Ethernet Historical Stats

ProbeView/SNMP is a software application that allows a 386/486 PC to be used as multiple (or portable) network management stations, giving you a window into the network by accessing the LanProbe monitors.

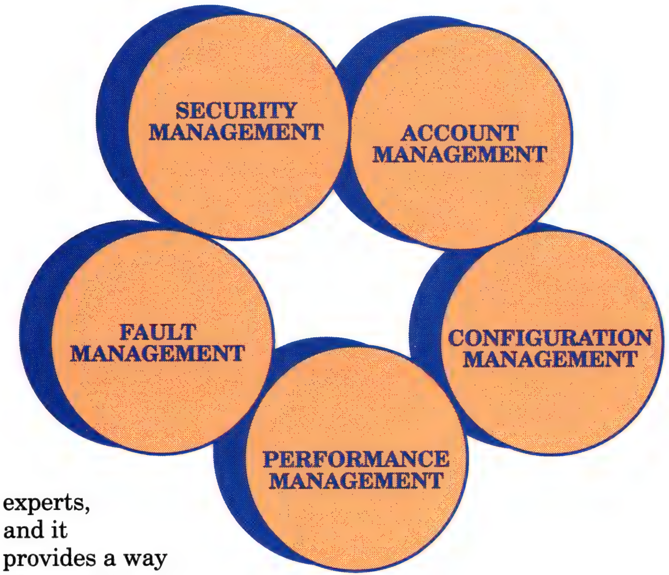
"The applications that operate with LanProbe and the power agents are being ported over to the IBM and DEC environment — this is in our strategy, plans," Brown says. "We will provide the tools, regardless of the framework or the platform."

By setting threshold levels in these devices and distributing them around the network, the data-collectors and samplers will trigger when problems arise, and report back automatically to the central site. They are triggered by customised thresholds, so they don't add to the network overhead unless there are problems. Most LANs, for instance, only operate efficiently at the 30-to-40 percent level, and if you start to experience 70-to-80 per cent loads, you are already heavily overloaded. So parameters such as 'percent utilisation' can be used as a trigger: if the segment exceeds 40 percent, the LanProbe will automatically report back and alarm the management group.

HP NetMetrix is a powerful combination of five software applications which can access software-resident data-collectors running on standard hardware platforms for Sun operating systems. This 'power agent' is scalable, reliable and transportable, and the host workstation can be used for other functions. HP NetMetrix can also address Ethernet, Token Ring or FDDI. Hewlett Packard's vision is to grow their management system to include all major platforms and technologies.

Distributed solutions are the way to go because they avoid many of the delays and expenses involved in shipping your 'Mr Fixit' around the country. By evolving network management to use this approach, a company's human technical expertise can be centrally 'hubbed', and used to maximum effect. It allows the company to leverage their human 'knowledge base' of highly skilled network

ISO NETWORK MANAGEMENT MODEL



experts, and it provides a way of responding proactively and reactively to any challenge.

The International Standards Organisation has published details of its desired model of network management . This model divides the field into five categories: Fault, Performance,Configuration,Securityand Account management. HP's management and monitoring equipment play a key role in the first three and a partial role in Security management issues. HP partners provide solutions addressing security and accounting management.

Companies are beginning to implement these integrated systems, but, in most Australian companies, trouble-shooting still relies largely on having the right management and monitoring equipment at the right place, at the right time. And with much current test equipment, this means having someone there with the skills to directly interpret the readings.

“Generally network management [in Australia] is performed in a piecemeal manner, using specific tools for each of the different network types. There is high reliance on user complaints for the detection of faults or substandard performance in the network,” says the ATUG report.

This is the traditional way. The expert and his suite of test tools are required to travel to the trouble spot — after the problem has arisen. This may be essential, today — but this approach is changing, and must change.

Centralised Management

To create a migration path to centralised management, HP provides monitoring and analysis applications that allow the manager to have complete ‘visibility’ of his LAN, WAN or internetwork. Composite products such as data-collectors, have attendant centralised applications which are fully standards-based, and are capable of being integrated into all leading topologies and platforms.

“Companies don't have the time to dispatch an engineer when problems occur, but there's a limit to what the remote network management products can do today,” says Robert Wallace. “So there's still a need for dispatch tools which can be sent to the location.”

Test equipment from many vendors can now be distributed around the network where it will report back under remote control. But the full suite of problem-solving functions then often must be provided at each major location, and this is a costly approach; an approach which is complicated by the fact that many distributed testers in useare proprietary devices.

The trend these days, is for some of the reporting to take place at the source — in the hubs, bridges and routers — or in specific segments of the network using LanProbes and power-agents. So the ingenuity of management and monitoring technologists is already helping solve these multi-vendor, multi-protocol problems.

Protocol Analysis

Modern HP protocol analysers, for instance, are now much more sophisticated than the old ‘data scopes’, and they were designed to handle heterogenous environments. These days, protocol analysers are automatically looking for protocol violations by checking every packet, and maintaining tables of traffic flows, violations and errors.

Until recently, a number of different models of protocol analyser were needed to handle the wide range of LAN and WAN protocols, but recently Hewlett-Packard consolidated its range into a single unit with various ‘protocol’ docking modules to handle the necessary dedicated functions — and they then added an expert-system for intelligent analysis. As a result, HP's Network Advisor, is now an intelligent LAN/WAN tool which is notable for its easy-to-use features and for its graphical displays.

“A network trouble-shooter can't take a week learning to understand his tool,” says Brown, “so we've designed the Network Advisor as a single LAN/WAN device with a graphical interface similar to Windows.” And, by using an object-oriented approach to the software design, HP was able to provide Network Advisor with a number of key features, the main one being multi-tasking. The technician can launch a number of different measurements at the same time, and can be transmitting and receiving at the same time, conducting tests in the stimulation-response mode.

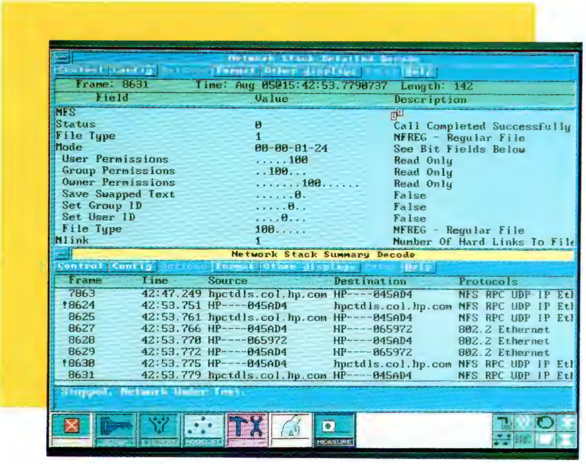
Protocol analysers are basically PC's with special software, but they must be rugged and portable. If a problem can't be resolved from the central control using distributed and embedded tools, then the manager must elevate his problem-solving techniques from the strategic to the tactical level — which generally involves dispatching skilled personnel to the site of the problems. And this expert must carry a full complement of powerful, dedicated tools, like a protocol analyser. Network Advisor provides breadth and depth to protocol-decodes on Ethernet, Token Ring and FDDI networks.

A protocol analyser is a more expensive device than a probe or agent. It has more capabilities, and may require the services of a more capable individual. However the Network Advisor can be embedded — but this is only done in special situations in critical segments, or with high-bandwidth networks, because these tools are generally too expensive to service only one network segment.

Expert Systems

Network Advisor captures 100 per cent of all traffic, and it can simulate traffic loads at the 100 per cent level. It performs in-depth analyses, decodes many different protocols, and provides all the relevant statistics in an easily understandable form. In these circumstances, too much information is a significant problem, so HP has implemented some expert-systems functions in Network Advisor to simplify the interpretation of the data — which are not yet available in cheaper devices.

Automated software here does the mundane, the repetitive, human-error-prone process tasks. When an expert is attempting to scan through thousands of frames he can easily make an error — but computers don't, so the software interprets all this mass of data, distils it, and provides the technician only with the critical data.



```
  Frame: 8631      Time: Aug 05015:42:53.7790737  Length: 142
      Field                   Value                   Description
NFS
Status                        0                       Call Completed Successfully
File Type                     1                       NFREG - Regular File
Mode                          00-00-01-24             See Bit Fields Below
 User Permissions             .....100                Read Only
 Group Permissions            ..100...                Read Only
 Owner Permissions            .......100......        Read Only
 Save Swapped Text            ......0.                False
 Set Group ID                 .....0..                False
 Set User ID                  ....0...                False
 File Type                    100.....                NFREG - Regular File
Nlink                         1                       Number Of Hard Links To File
```

```
  Frame     Time      Source             Destination        Protocols
   7863   42:47.249 hpctdls.col.hp.com HP----045AD4       NFS RPC UDP IP Et
  !8624   42:53.751 HP----045AD4       hpctdls.col.hp.com NFS RPC UDP IP Et
   8625   42:53.761 hpctdls.col.hp.com HP----045AD4       NFS RPC UDP IP Et
   8627   42:53.766 HP----045AD4       HP----065972       802.2 Ethernet
   8628   42:53.770 HP----065972       HP----045AD4       802.2 Ethernet
   8629   42:53.772 HP----045AD4       HP----065972       802.2 Ethernet
  !8630   42:53.775 HP----045AD4       hpctdls.col.hp.com NFS RPC UDP IP Et
   8631   42:53.779 hpctdls.col.hp.com HP----045AD4       NFS RPC UDP IP Et
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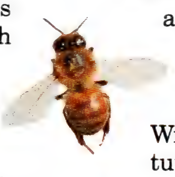
What makes the Network Advisor such an exceptional tool for LAN/WAN management, is this interpretation of problems and presentation of only filtered and processed information to the user, and future developments in artificial intelligence will take these processes further. "The stage we've reached currently with Commentator, the problem-solving mode of the Network Advisor," Brown explains, "is that it looks at all the traffic on the network, watches all the frames going by — and if it sees protocol errors, violations, or connection problems it commentates on these — it 'notes' these problems to you."

"Traffic on a LAN flies by at thousands of frames a second, and there's no way a human can watch them go by. So the automation, accuracy, and speed of the microcomputer is combined with some expert systems technology, to create a machine which can check all frames and present its findings to the user in the form of a simplified English description of what just happened."



"The key is that Commentator's expert-base overlays the protocol analysis, and the software does the basic interpretation work for you. We are building the knowledge base of Network Advisor all the time, and we offer software updates, typically about twice a year," he adds.

So while this is a dispatch tool, increasingly, Network Advisors are also being embedded and operated from off-site locations using remote trouble-shooting software. This is especially true in critical network segments, and the managers of large FDDI networks are taking this distributed analysis approach with Network Advisor. By using the protocol analyser in this way filtered, statistical information is available on throughput and performance degradation, in various conditions (even under extreme load), and the filtered information is delivered to applications in the central management console.

Until recently, the language of embedded equipment agents was proprietary and this obviously created problems when trying to establish centralised management. "SNMP is now the leading standard language for agents in network equipment," says Wallace, "and that's why we are able to move into a new era. Now that we have frameworks like HP's OpenView and a wide range or purpose-written and ported management applications, we can continue to use other people's bridges and routers. Provided they are SNMP-compliant, we can talk to them."

By anticipating the most common fault scenarios, modern management and monitoring equipment on the network can be programmed to trigger a specific set of tests which will be run whenever they encounter a specific set of parameters. These automated test procedures will rely on information flowing from a number of items of embedded monitoring, analysis and test equipment. Manual intervention should only be necessary when the limits of automated functions are reached.

And evolving management in a way that allows us to take a pre-emptive approach is also necessary — we must discover potential sources of problems before they disrupt the network. But pre-emptive troubleshooting can't be done through distributed tools which just report troubles or analyse existing problems. In times of rapid change and increasing reliance on the network as a basic business resource, it is prediction rather than reaction that should be the guiding philosophy of the network manager and this requires a higher level of technical sophistication.

For true pre-emptive troubleshooting, we must be able to monitor and measure a wide range of network parameters, and then to apply intelligent analysis to this data based on accumulated human experience. We need to measure the ebb and flow of traffic across the whole network and build up a 'mental' (human and computer) view of the expected range of conditions within the dynamic traffic streams.

As client-server architectures grow, this 'nice-to-have', overall-picture-of-the-network, approach to communications management, becomes an essential in the larger networks. Mission-critical applications are now distributed increasingly across the network, rather than being buried in the bowels of a mainframe, so corporate network access then becomes the key to corporate productivity and its profitable assets. So maintaining the viability of the network is no longer just important, it is essential.

With pre-emptive management we can also constantly tune network performance and perform effective planning analysis. Constant monitoring of performance in all key network segments will quickly identify the bottlenecks, and make upgrade-expenditure and the allocation of human resources much more effective.

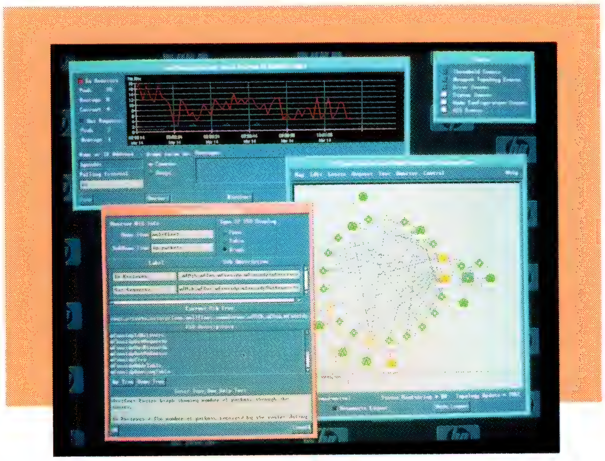
There's no such thing as 'normal' conditions in these large distributed networks, so we can't just hope to detect incipient abnormality — and, by the time we detect it, it's too late anyway. What we must look for, in many cases, is a 'disharmony' of otherwise normal events, which only constitute an abnormality in terms of the overall pattern. We need centralised hardware and software to isolate sense from nonsense.

And we know from experience, that to be effective, solutions must be presented to the human operators in human-perceptual terms — and this means a graphic view of the world. There's no substitute for images or maps of the total network with dynamic displays of traffic levels and thresholds. Here, one good graph is worth a thousand words hidden in data-tables.

Distributed Management

The applications which perform these centralised analysis functions can operate independently, or they can fit into a management framework running on the central control workstation. HP, IBM, DEC and Sun each offer management 'frameworks' or 'platforms', which appear, to the casual customer to be different solutions to the problem of overall network management.

What is not well known, is that both the IBM NetView and the DEC MCC platforms are OEM versions of HP's OpenView (with proprietary features added). But recently DEC announced that it is abandoning its individual efforts and joining forces with IBM to develop a system based on OpenView. In addition, the OSF (Open Systems Foundation) has selected OpenView to provide the key technologies for the Distributed Management Environment (DME), making it the new industry standard and the obvious choice for multivendor network and system management.



OpenView is a standards based 'framework' which enables the integration of various management applications. The acceptance by industry of Openview, and the licensing of the platform products by over 200 vendors, has made Openview a defacto industry standard.

OpenView is certainly gaining market-place momentum: most third-party hardware and software manufacturers see this as the way of the future. Over 50 Network Element Providers and most of the top Fortune 1000 companies now use the platform. So the HP-lead charge for a single standard form of network management is becoming stronger and stronger.

This is an open standard where independent applications developers are encouraged to contribute. HP offers management applications itself for OpenView in the areas of Fault Management, Performance Management and Configuration Management. Security and Accounting Management is supported by a number of third party software packages.

OpenView's Management Platform Architecture decomposes the network and system management problems into several key components:

- A distributed management infrastructure,
- A graphical management user-interface,
- Management applications,
- Management services, and
- Managed objects.These

cooperating components are all accessed through standard, well-documented application programming interfaces (APIs). The distributed infrastructure provides the facilities for establishing and maintaining communications between these components.

The modular separation of the user-interface from the management application in the OpenView environment, also allows another form of customisable integration — several management applications can drive a single display, or a single application can be used to drive multiple displays.

The management services act as the bridge between the infrastructure and the management objects: they support the protocols and interfaces necessary for communications with real resources, event forwarding and filtering services, a management database(with SQL access), and metadata services. Managed objects are abstractions of real resources which can be maintained through the graphical user interface (GUI).

So the OpenView environment is completely modular — a family of network and system management tools for both local and wide-areas, and for homogeneous and multi-vendor networks. Since it was intended, from the start, to cater for products of many varieties and intrinsic peculiarities, it was designed to use the best features of SNMP, CMOT and CMIP. And with recent upgrades, it now provides a migration path to OSF's proposed DME (Distributed Management Environment) standard. It's current success is very largely due to a wide-spread recognition that it offers managers, developers and vendors a future-proof distributed standard for network management.

Dr Ali Al-Tarafi, HP's System and Network Development Manager, said in a recent speech to network specialists that OpenView contains all the elements a user or developer needed to implement a DME management environment or application: "It's the first product that offers the full DME Windows, DME XMP-API, and the DME Distributed management Infrastructure with SNMP, CMOT and soon CMIP," he explained. "Furthermore, HP has committed to protect OpenView users from any changes to the final version of the DME specifications. This commitment is possible only because HP has implemented the full DME APIs ahead of any other vendor."

The kind of money being invested in local networks today, mandates a move towards a professional strategic management approach. A network manager must have a complete set of management and monitoring tools at hand to match the organisational goals and expectations being placed on today's LANs. The stakes are too great to do otherwise; the traditional ad-hoc approach to network maintenance can't continue.

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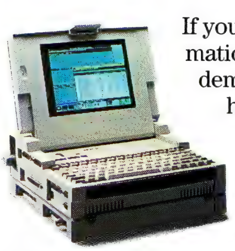

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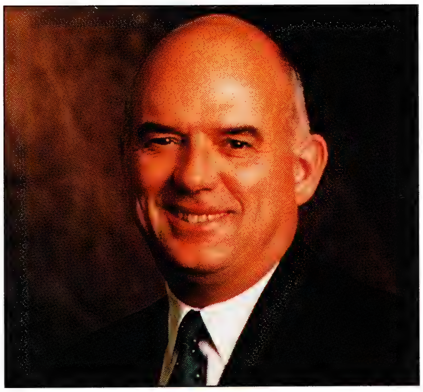

TCNZ: The Quiet Competitor

Jeff Carter

Director Enterprises and International, Telecom Corporation of New Zealand

Jeff Carter is responsible for the enterprise companies, international activities and development of domestic and offshore business at Telecom Corporation of New Zealand Ltd (TCNZ). He is Chairman of Telecom NZ International Ltd, Telecom Directories Ltd, Telecom Mobile Communications Ltd, Netway Communications Ltd and of Pacific Star Communications Pty Ltd, a joint venture with Bell Atlantic operating in Australia. He first arrived in NZ from the UK as Chief Executive Officer of GEC (NZ) Ltd in 1986 and joined TCNZ as Director New Ventures in 1988. He has an Honours Degree in Mechanical Engineering from Imperial College, London. While attending the PTC'94 conference in Hawaii he talked with Liz Fell.

You joined TCNZ before privatisation. What is the major difference now?

Carter: There is a very big difference between having a controlling Board of Directors that are a mixture of political appointments and having a Board that are fundamentally telephone people and understand the business. In my view a Government-constructed Board does not contribute very much to the direction of the company.

AC: *But your Board is not just telecoms people. Only about half represent the US telco shareholders.*

Carter: Half of them, but there were none before. There were Government appointees, the odd university professor and so on. Now we've got four Americans who are telephone people, Alan Gibbs and David Richwhite, who are very good businessmen, John King, a senior partner with a law firm, and Roderick Deane himself, the Managing Director. They are all big contributors to the company.

AC: *What have your two major shareholders, Bell Atlantic and Ameritech, brought to the company?*

Carter: Resources. There's a great amount of input. We can get much of what we want, a lot of which they may have spent millions researching. As a very small telco, we try not to be trail-blazers in the sense of trialling new technology. We are quite keen to be second and pick the eyes out of tested technologies or systems. We have established a very good telephone company because of that.

AC: *Pre-privatisation, a Government briefing note said TCNZ would benefit from offshore investors in terms of technology, economies of scale and international expertise.*

Carter: I don't think economies of scale are there at all in the sense that we don't buy through them. Their contribution is in operating systems and operating experience. For example, we're revamping our operating systems and they're contributing to that. We're moving into Pay TV and they're contributing input on ADSL and so on. They are very efficient local telephone companies but they have great gaps in their product ranges. US regulations stop them from doing things; for example, international and long distance telephone traffic, so we can actually contribute to them in areas where they have no experience.

AC: *Did they assist your latest restructure and the merging of TCNZ's regional operating companies?*

Carter: Yes. We've been through that process for which the buzz word is 're-engineering.' They have assisted in our update of operating systems. But again, things are different in NZ and both we and they have come to realise you can't just migrate or transplant something because it worked in the States.

AC: *Were those lessons hard won?*

Carter: I think so. Yes.

AC: *Can you give an example?*

Carter: I don't wish to give any specific examples. But the size of the country, the attitude of the New Zealander compared to the American, the demographics, all mean that certain things they accepted as gospel in the US just don't wash in NZ.

AC: *Is it correct to say you are responsible for the more lucrative parts of TCNZ's business: mobile, electronic directory, international and enhanced services?*

Carter: The national telephone company is pretty profitable as well. What I have is the growth areas.

AC: *What business areas are you developing for the future?*

Carter: Three areas and they all relate to convergence. First, the development of PCS and the mixture of PCS and fixed line local telephone networks. Second, the convergence of information technology and the fact that we see ourselves in the future as an information processor and a manager of content rather than just a carrier. We want to be deeply involved in the systems integration and management of the data being carried. The third area, entertainment services, pay TV, interactive multimedia, again relates to managing customer services rather than just carrying them.

AC: *What are your plans for PCS [Personal Communications Services]?*

Carter: Everybody has their own view of what PCS is. Our first PCS pilot starts this year and will essentially use a cellular base to develop a microcellular offering. We'll take a town or an area and begin to introduce lower cost handsets and lower tariffing to see how customers react to having a low-premium mobile service. It won't be a DECT 1-8 MHz thing. It will be based on our AMPS cellular. We have considerable spectrum, so we can afford to be a little generous with our uses of it. Number profitability using IN features will also be a key part of the trial.

AC: *Why did TCNZ decide against GSM?*

Carter: It was an easy decision. The investment required to install Digital AMPS was less than $NZ20 million just to install the new software and hardware in the infrastructure. We have the existing analogue network and by just plugging the digital transceivers we require into cell sites, we have a digital PDMA service.

AC: *Do you think Australia made a mistake in choosing GSM?*
Carter: They went that way to open up competition. The silly thing is that Telstra are being forced to relinguish the AMPS frequency. You've a million people with AMPS phones. But the contracts of the other mobile network suppliers include a commitment to close down analogue AMPS.

AC: *And if you were Optus or Vodafone?*
Carter: I'd probably sue them.

AC: *You'd sue whom?*
Carter: The Australian government, if they change the rules.

AC: *If you were entering the market to compete with Telstra, wouldn't you want a so-called 'level playing field'?*
Carter: I would have wanted to enter the market with the same technology as Telstra to allow migration of the existing customer base on to my network. That's what, in effect, the reseller arrangements are allowing. I think BellSouth in New Zealand made a big mistake in opting for GSM because they were then unable to attack our customer base.

AC: *And Telstra is also entering NZ with GSM?*
Carter: Yes.

AC: *On the IT side, you're in a consortium providing imaging and screen access to public registry data. Who are the technology partners and will that expand beyond NZ?*
Carter: Unisys and Azimuth are partners and Kodak is one of the preferred suppliers. There is a similar operation being trialled in Canada and another limited trial in Australia. It's not really high risk technology though it uses state-of-the-art equipment. The real trick will be running the business and being able to sell access. Most initial applications are central or local government database access. I think it has good opportunities.

AC: *You're also Chairman of Netway Communications?*
Carter: Netway was established in 1988 as a joint venture with the Freightways Group to provide managed network and by-pass services. It was a kind of stalking horse for us because we had no competitors at the time. When Clear appeared, in-house competition seemed unnecessary so we have converted it to a wholly-owned subsidiary providing value added messaging, managed network services, VPN and frame relay operations.

AC: *Does Netway have any major competitors now?*
Carter: Synet, which is owned by NZ Post, and quite a few systems integrators compete with their own X.25 networks, companies like Paxus, now called Continuum.

AC: *In offshore business development, what is your overall strategy?*
Carter: The basic business strategy is to pursue opportunities where we believe we have a comparative advantage, where we have done something in New Zealand that we think is exportable. Pacific Star, for example, as it grows, is beginning to look a little like a Netway in terms of its additional services.

AC: *Is Pacific Star your main entry vehicle to Australia?*
Carter: Yes. That company grew out of the Kalori Group which withdrew from bidding for the second carrier licence.

AC: *Why didn't you enter Australia as a service provider or reseller like AAPT?*
Carter: We didn't particularly want to disrupt relationships and we didn't see that as particularly profitable.

AC: *In other words, you balance co-operative/competitive tensions in your relationship with Telstra?*
Carter: We always try. It's a multi-faceted relationship.

AC: *So as a systems integration/outsourcing/facilities management company Pacific Star is less threatening?*
Carter: Yes.

AC: *For the Queensland Government network contract, is it correct to describe Pacific Star as a broker of Telstra and Optus facilities?*
Carter: We broker services and manage the network for the Queensland Government and have taken on their staff. The brokering will become less important as prices commoditise. The really important capability is to offer management services.

AC: *You're using Bell Atlantic's operations support system software. What are the services you offer? Smart billing, for instance, and discounts?*
Carter: Yes, smart billing is important, but there's a range of other services.

AC: *Is Pacific Star profitable at this stage?*
Carter: Yes.

AC: *And it's only operated for about 18 months! Where does it move next? To private sector customers or offshore?*
Carter: Sheraton Hotels in Australia is a customer now. There's a lot of business opportunity. We haven't talked about offshore.

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AC: *But isn't Pacific Star running for a network management contract in Indonesia?*
Carter: That was in support of Bell Atlantic as the lead contractor. Both Pacific Star and Telecom NZ were to provide customer management systems for part of Indonesia. The job is being rebid to cover all of Indonesia.

AC: *Has Telecom NZ got an office in Indonesia?*
Carter: Yes. We have one man there.

AC: *And Bell Atlantic has a couple of Indonesian ventures already, including mobile. Are you involved there?*
Carter: Only peripherally.

AC: *Wouldn't you quite like to join them and have a go in Indonesia?*
Carter: Yes.

AC: *Haven't they asked you?*
Carter: They may.

AC: *But they're in Indonesia already without you.*
Carter: What Bell Atlantic have in Indonesia at the moment is an NMT licence which could conceivably turn into a GSM national licence. If that happens, then maybe the scenario will change.

AC: *So how do you decide whether TCNZ or Bell Atlantic alone will bid in the region?*
Carter: Let's take Indonesia. We know what we can do and Bell Atlantic knows our capabilities. We do a fair amount of work with them overseas, and there has never been a competitive clash because they tend to go for mega deals and we tend to go for medium to small opportunities. Sometimes they will advise us of business opportunities that are too small for them. On larger jobs we may undertake part of the project or perhaps provide staff. You have to understand the differences. We would not, for example, invest in a major cellular operation in Indonesia because of the total cost. If we were bigger there could conceivably be some problems. But we are not and, in fact, we are a very different organisation.

AC: *And does Ameritech hand on Southeast Asian opportunities?*
Carter: At the moment they are much less active in the Pacific region. They are more active in Europe.

AC: *Do you have other Asian ventures coming up?*
Carter: At any time we probably have about half a dozen in terms of tenders for managing a process or undertaking a contract. We've bids into Sri Lanka, India, Thailand, Indonesia and PNG at the moment.

AC: *What about Vietnam? Haven't you had problems because of the US shareholders?*
Carter: Vietnam was a problem because of US 'Trading with the Enemy' regulations. We've applied for a waiver, and that's been granted for the first part, which means we can go and seek business, but we're waiting for a complete waiver to be considered for the US Government to allow trading. That's the only situation I know where the US shareholding has effectively constrained what we're doing.

AC: *What are you doing about cable TV and broadband entertainment services?*
Carter: We're piloting 600 houses in Auckland with broadband pay TV access. We've put ten video/TV channels on it, both free and pay channels. Sky has delivered Pay TV in NZ using UHF for the past three years so there's a customer base already of about 150,000 people. Because of our access and relationship with Sky, we don't have to panic in terms of building a pay TV customer base. We don't need to take an early decision, say to run fibre optics everywhere. What we are mostly testing in the pilot is the attitude of the public to multichannel pay TV. Viewing hours in NZ are about half those in the US and Europe. We are low TV watchers.

> *". . . I think it is highly probable and probably desirable that over the next few years there will be a single large South Pacific telco [. . .] I see it as alliances moving to an entity at some stage."*

AC: *Does the pilot involve fibre-to-the-curb?*
Carter: Yes, with coax drops to the home.

AC: *What about ADSL?*
Carter: What we've tried to do is build relationships with TV companies. We've constructed head-end equipment to deliver the channels. We may pilot ADSL interactive video as well. I think delivery of broadband services is quite likely to be through a mix of technologies.

AC: *What's your relationship with World Communications Lab, the NZ company with a mission to promote broadband?*
Carter: They are looking at the early 'superhighway' in NZ. Ways in which applications of broadband can be brought forward. They are looking particularly at telemedicine, telelearning and other applications. We support them, as does the NZ Government, Clear Communications, TVNZ and some other companies.

AC: *How will the Bell Atlantic/TCI merger affect your plans given they are both Sky shareholders?*
Carter: We have options to take over that equity. At the moment the Halekulani partnership controls Sky . . .

AC: *Halekulani?*
Carter: That's the name of hotel next door [in Waikiki] where the deal was done. The partnership is Time Warner, TCI, Bell Atlantic and Ameritech. In that agreement, there are options to acquire the Bell Atlantic/Ameritech shares at their discretion.

AC: *That all sounds very cosy given TV New Zealand, another Sky shareholder, also has a stake in your competitor, Clear.*
Carter: Maybe that will have to be rationalised one day. TVNZ will have to decide whether it's right to stay in Sky, given the development of the ownership. Remember they were in Sky long before the North American Halekulani partnership bought equity control.

AC: *If TVNZ were privatised, would you be able to buy in?*
Carter: Yes. I don't know what TVNZ's future is and whether they're going to be split up and privatised. And I don't know whether they will continue holding shares in Clear. I always find it very odd that a Government organisation owns shares in Clear.

AC: *Are there legal barriers to controlling both Sky TV and TVNZ?*
Carter: I don't think so. We're not in TV at the moment and it's a different market. It would, however, be a Commerce Commission issue.

AC: *Meanwhile TVNZ's transmission arm, BCL, has a cable TV trial and Kiwi Cable is busy too. Will there be three pipes to the home?*
Carter: No. Kiwi Cable is a small operation that has an agreement with one of the local power companies just to string cable. BCL have cabled a small area outside Wellington with bad reception but they're actually going to use it for some form of interactive trial. Telecom are determined that they will be the major supplier of pay TV services in New Zealand.

AC: *Would you be interested in buying Telstra if it's privatised?*
Carter: We couldn't. It's far too big for us!

AC: *Was the second carrier too big too!*
Carter: No. But I think it is highly probable and probably desirable that over the next few years there will be a single large South Pacific telco. At the moment Telstra is government-owned but I presume that at some stage strategic sections may be sold. I don't believe it should be split up. If a strategic share were to be put on the market, a number of companies would look at it and we would obviously take an interest.

AC: *In terms of price tags for Telstra, are you in the $20 billion plus group?*
Carter: No.

AC: *Is Telstra losing value daily?*
Carter: It's a wasting asset at the moment until the regulatory environment is levelled up a bit.

AC: *Do you see this South Pacific telco as a set of loose alliances or as a merger of telco companies?*
Carter: It could be either. I see it as alliances moving to an entity at some stage. What form that takes and whether it includes a Singapore, Hong Kong or someone else, I don't know, but you could construct a single major telephone company serving the region.

AC: *Your 40% share in Telecom Cook Islands involved the Government ousting Cable & Wireless. Is it correct that C&W got about $NZ8.5 million in the payout?*
Carter: There was an arbitration process and a 'Do Not Disclose' clause in the settlement agreement.

AC: *I understand Telecom Cook Islands is very profitable. You got a very high return on your investment last year.*
Carter: It's profitable, but not very profitable.

AC: *Would the South Pacific telco embrace the small island carriers?*
Carter: I think the developing island telcos still need the support of major players in the South Pacific. Many need to privatise their operations in some form. And the problem in the Cook Islands was that their international operations were split from their domestic business. That is the Fiji problem and probably in Tonga also.

AC: *Do you have a foothold in PNG?*
Carter: We have been selling the Yellow Pages directory there and we have a contract to design and evaluate a cellular system.

AC: *Is that a stepping stone to a joint cellular operation?*
Carter: Hopefully.

AC: *Will they adopt GSM?*
Carter: They are deciding whether to go GSM, Digital AMPS or analogue AMPS.

AC: *So do you envisage there will be three or four global super-carriers eventually?*
Carter: Very possibly. But equally important is the possibility of a large South Pacific telephone company, a big informal local and international company that may align with one of the global carriers.

AC: *Given the trend towards forming global carrier groups, why haven't you joined or aligned with one of these?*
Carter: We probably will at some stage.

AC: *Will the global game change for you with BT taking over MCI's share in Clear?*
Carter: It's not certain that they are. What is clear is that MCI is going to sell, but other Clear shareholders will have views and rights and we don't know what the BT/MCI proposals for this region are.

AC: *Has AT&T's WorldPartners approached you?*
Carter: Yes.

AC: *If we assume BT becomes a Clear shareholder, how will that affect you, given BT's strong presence in Australia?*
Carter: If BT takes over MCI's share, I think we will find more competitive emphasis on international traffic and less on domestic. MCI is a very good marketing company and their absence will be a loss to Clear. BT will be keen to build their global business, but we feel we can compete with that pretty well. There are only three or four global size companies in NZ that are probably of interest to BT in a worldwide sense.

AC: *Internationally, of course, you're already competing with Telstra as well as Clear in areas such as transit traffic and hubbing?*
Carter: We are trying very hard to build our transit business and that, of course, is in direct competition with Telstra and others. We have actually agreed some transit arrangements while here in Hawaii. Telecom NZ is an efficient telco and we are winning substantial transit business. We support the reduction of accounting rates towards cost-based rates and we have been working on that for some time.

We do some hubbing, but it's more difficult. We try to make people understand that we're not distant-dependent in a hubbing sense, but major corporates tend to hub where their big offices are. Most world majors have a presence in NZ, but many are subsidiaries of an Australian, Hong Kong or Singapore office.

AC: *Has Optus made a difference?*
Carter: Optus is obviously in the process of making Telstra get its act together and is beginning to make a difference. We get on very well with Optus. They are about the same size as us and its a very easy relationship, much easier than with Telstra. Telstra, however, is more important to us.

Liz Fell is a freelance journalist based in Paddington (NSW).

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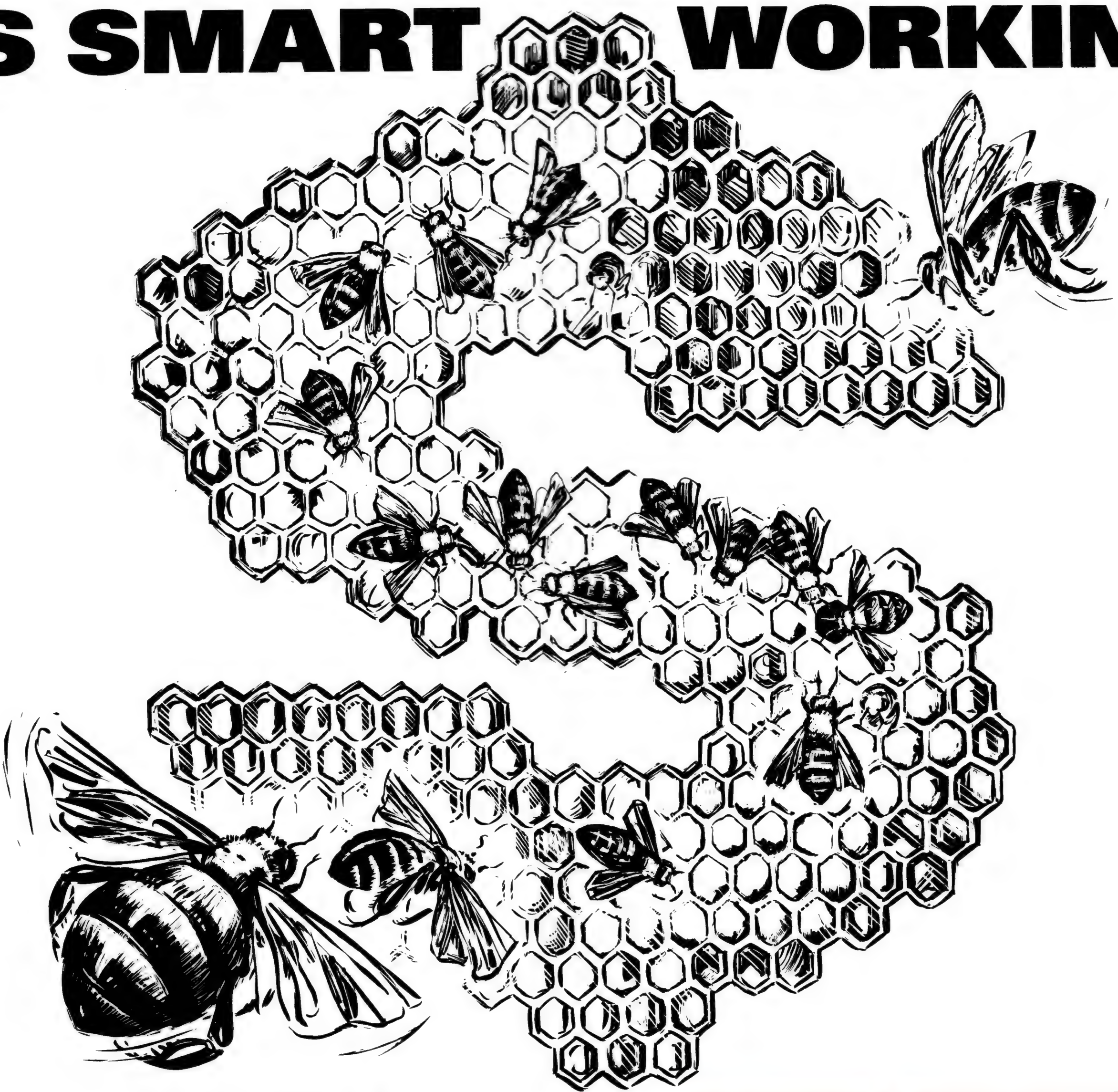

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Tom Amos

Bundling Local Call Access

Telecom's by-pass of over 220-odd charging boundaries with a new non-zone-related tariff plan has again sprung into the limelight, this time not as a pseudo trial but as a new service to be offered in all major cities. Tariffs and local calls are generally a boring subject, but this introduction of two sets of rules, one for the access system owner and one for everyone else, adds considerable spice.

In Government circles, the open exploitation of loopholes in the zonal charging system by the dominant carrier was an unexpected outcome of the deregulation process because the rules were clearly set to average down all traffic costs rather than be used as a competitive weapon. After the sale of the second general carrier licence, Optus had the choice of where competition would start ,and the Government was keen to ensure that the dominant carrier on Day One would not abuse its position (whether intentionally or not) and installed a set of checks and balances along with ensuring that Austel was given a pro-competitive charter. In addition, a review and a sunset clause on the duopoly were also set at 1997 before any additional licences can be issued. In exchange the two duopolists were given two-decade-plus renewable infrastructure licences.

As it has turned out, the competitors have followed traditional lines and entered in the high margin areas and with only a few services. The access services such as the local loop have virtually remained competition-free, due to the low concentration ratios of traffic and the high cost of recabling. This will eventually change if wideband services are introduced to the home.

The local loop has thus become an area of effective technology monopoly due primarily to the prohibitive costs of either replication or replacement of this mature technology base. At the time of the construction of the legislation it was also considered that unnecessary duplication of infrastructure was not in Australia's interests — hence the emphasis on granting infrastructure licences rather than operating licences at the time.

It has taken Telecom a little time to recognise that the bundling of the local loop technology monopoly component into a flat call charge would allow the extension of the technology monopoly boundary outside the traditional call boundary and into the competitive areas. The extended call unit fee area option or EUCA tariff package was born, reaching out to restore lost revenue by offering something that no one else could.

The EUCA concept was a Telecom experiment to not only test the marketplace, as claimed, but to also check the attitude of the regulator and the other players to a unit fee tariff option that exceeded the traditional boundaries. The tariff was not disallowed and as a result, the very basis of all the licence conditions was fundamentally changed. The concept of fair access via timed interconnect and call price boundaries for both resellers and the other carriers may be significantly eroded as large bands of traffic may now effectively not be available to anyone except the local loop supplier. What a win and what an oversight by the Government in its legislation!

Redefining the charging boundaries by overlaying new ones is a big game as the limit on distance is only one parameter. Another is time: Normally, timed calls are utilised to raise the revenue on used lines and put the system on a more user-pays basis. Not in Australia though — here we increase the distance and run an untimed flat fee as there is a Government prohibition on the introduction of domestic timed local calls!

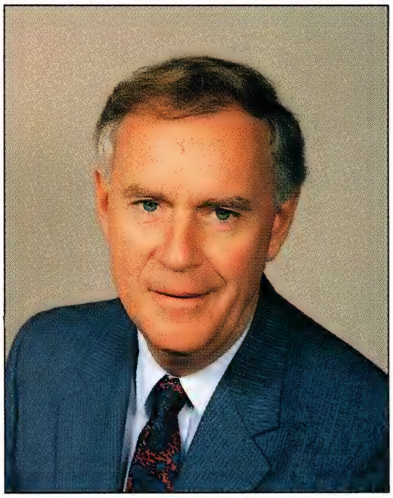
The first step in the introduction of bundled access fees was a 75km radius EUCA and now it is suggested that this should be increased to 200km or so. In reality, the aim is to introduce non-charging zone-related point-to-point call fees, charged on a radial basis as suggested some time back. Here, zonal boundaries have no meaning for anyone choosing the bundled options but they remain in place for everyone else including the other service providers — a redefinition of the level playing field.

Harking back to the dilemma, the choices available to the Government when originally deciding on the way in which to keep the monopoly honest came down to CPI-X related price baskets for services and the movement towards some external auditing process of the dominant carrier's service provision cost. The latter has bogged down, as was predicted at the time. The industry also at the same time suggested true and full accountancy separation — even separate operating companies for the local and long haul components of Telecom, to try and prevent the inevitable cross subsidisation that is now occurring. It did not happen, although it is a more plausible way to introduce competition in all facets of the business than hoping that legislation intent is to be followed as is currently the case.

The competitive dilemma is that the local loop components are all sold to the carriers at the same price . . . in this case at an interconnect rate of 3.14 cents or greater per minute. Others further down the food chain — the resellers — pay proportionally more. It is thus easy to fix the problem by enforcing separation to remove the cross subsidy access. Then the cost of the interconnect could be set at the rate that ensures a fair return for the provider. Competition should be available on all facets of a telecommunication service but there is no competition when the cross-subsidy on the end-to-end services is employed. Unless the Government and Austel get effective accountancy separation the competition issue will remain in such a mess.

Point-to-point overlay charging by the dominant carrier is a problem for both resellers and new carriers alike. It has the potential to destabilise any positive competitive changes that would result from a post-1997 environment and could ensure a muted duopoly for many years. Is it in the interests of the user that one carrier enjoys the benefits of a monopoly operation outside the original intent? Under some scenarios there may be a benefit, but only if the prices are truly cost related . . . but how would you ever find out?

Tom Amos is a partner with telecommunications consulting engineers Amos Aked Swift.



Bill Melody

1997 Is Here!

After two decades of discussion about the convergence of communication and information technologies, there are increasing signs that the pre-conditions for widespread implementation are being met, and a new age of electronic communication is beginning. Policy deliberations in many countries and at international levels about information highways, multimedia, narrowcasting, the Internet and mergers of telecommunication, computing and media conglomerates demonstrate that a major transformation in the role and structure of communication in society will be taking place over the next generation.

Different countries have fashioned different policy paths as they move toward 21st century information economies. The emphasis in Australia is on a phased restructuring of the telecommunication services industry in two major steps:

- The establishment of a regulator (Austel), and a second major carrier (Optus) to introduce competition quickly; and
- Further liberalisation in mid-1997 to reflect the increasingly competitive global telecommunication market.

The policy issues associated with convergence were given priority status in the US late last year when the Government proclaimed a comprehensive 'Agenda for Action' for deploying a National Information Infrastructure (NII). In Australia the term 'convergence' acquired a jolt of realism when Telecom announced several alliances with the media sector and unveiled its Future Mode of Operation program to enhance the telecommunication infrastructure. The Government has established a Communications Futures Project and a Broadband Services Expert Group, each to examine the laundry list of national information infrastructure issues.

Research on the evolution toward the information society indicates that technology and supply are running a long way ahead of demand. For example, a CIRCIT survey of optical fibre-to-the-home experiments around the world showed a universal failure of demand. The multimedia experiments currently underway in the US and some other countries are desperately seeking a 'killer' service application that will stimulate large scale market development.

All these national initiatives are now attempting to unleash the innovative juices of the nation to stimulate new applications and consumer demand. The thrust of the US program is removing government regulations and other obstacles to the development of demand. The thrust of the Singapore program is enhancing personal capabilities and facilitating sectoral applications. The Australian thrust presumably awaits the expert reports.

It is noteworthy that the US emissary to Australia and its Prime Minister was not a telecoms industry leader, but Bill Gates, Prince of Microsoft. Telecommunication is only a part of the NII, and attention is now shifting to opportunities for accessing and using it.

There is increasing evidence that Australia's two-step telecommunication reform policy already has been superseded by events. It is focused only on the telecommunication service industry — restructuring the supply side of the market. Although it has done a good job at meeting certain narrow objectives, it is providing obstacles to demand-side reform, i.e. unleashing opportunities for developing new services and applications.

The downside of the Australian telecommunication duopoly policy is that it restricts market opportunities for all potential players except Telecom and Optus. To justify the $800 million Optus licence fee and to take the Aussat albatross off its hands, the Government has fashioned a telecommunications policy with significant barriers to new players and services through mid-1997.

Australia is doing reasonably well by international standards with respect to the pace of enhancement of the telecommunication infrastructure. Optus has forced major improvements in efficiency and consumer responsiveness for long distance and mobile communication services. But most of the new services in the future information society will be provided by others — specialists in applications, information services and niche market development.

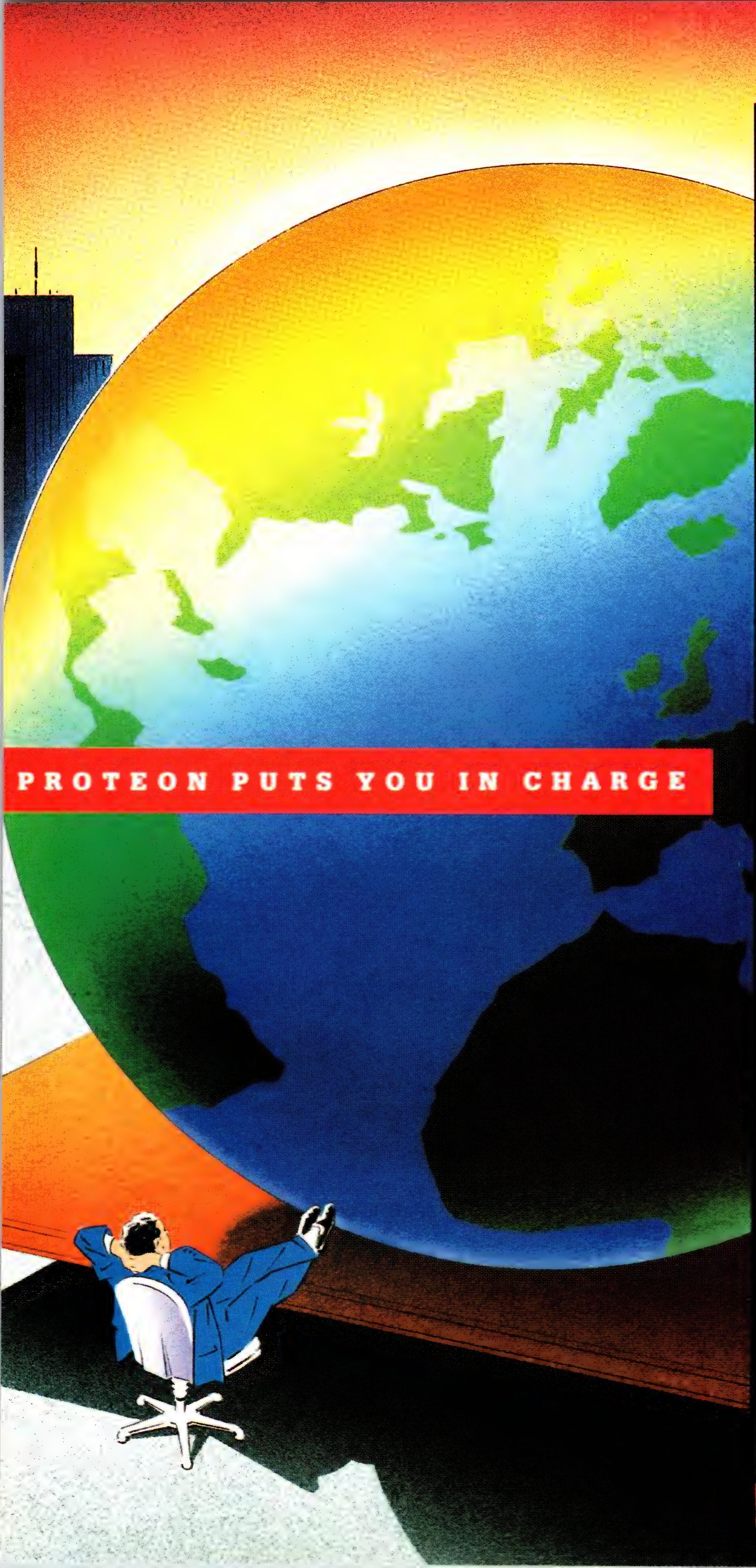
There is increasing evidence that restrictions are denying Australians access to new services and new applications at competitive prices. The VAS, resale, information and specialised services (e.g. VSAT, application networks etc.) sub-markets are all growing much slower than anticipated. New network applications in health, education and other sectors are proceeding more slowly than planned because access, tariff and service options available in other countries cannot yet be obtained in Australia. The barriers are not technology or service capability. They are carrier and regulatory restrictions.

Yet new service capability is coming on-stream at a steady pace. For example, this year several new satellite systems will become operational in the Pacific, providing capability for improving service and lowering prices for some rural and remote communications, as well as television program (including Pay TV) distribution and other services. But under current arrangements, most of these services can only be supplied through Telecom and Optus, which do not have incentives to see these competitive services succeed.

For the next three years or more Australia will be pursuing new applications, like multimedia, in an environment of self-imposed artificial restrictions. This will provide a drag of increasing economic significance to Australia's ability to access, apply and use its NII.

Australia's two-step telecommunication reform policy was based on certain assumptions about the global pace of change in this dynamic field. What was expected in 1997 already has arrived. The 'facilitating' duopoly policy has become a 'debilitating' barrier to essential further development. It is time to renegotiate the Optus agreement so that the 1997 liberalisation policies can be implemented now. It is time to exorcise the ghost of dead Aussat policies, and open opportunities for all Australians to contribute to the development of their information society.

Professor Bill Melody is Founding Director of the Centre for International Research on Communication and Information Technologies (CIRCIT, Melbourne).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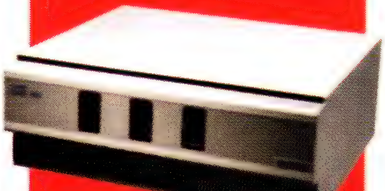

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Remote Connectivity: Branch Office Routers

This new breed of internetworking equipment gives users in remote offices higher-speed access to the corporate backbone while at the same time cutting the cost of linking up smaller branch sites.

Branch offices may be a long way from the big city, but these days they're anything but isolated: corporate headquarters — along with the corporate backbone, mail server, and database — are now as close as the keyboard. After all, those who've opted for the less frenetic lifestyle of the small town still need to exchange e-mail with other employees, transfer files among departments, and tap into network resources. Sure, those tasks can be taken care of via modems and bridges, but a new class of products known as access routers offer far better performance and much greater flexibility.

Access routers may be relatively new — the products really started to make a ripple just last year — but there's no shortage of suppliers. Well over 70 companies are already shipping products, with no sign of a slowdown in sight. Mainstay router vendors like Cisco Systems, Proteon and Wellfleet Communications all offer slimmed-down versions of their proprietary boxes. 3Com, on the other hand, has just announced a new family of products designed from the ground up especially as branch office units — the NETBuilder Remote Office range. The company claims the new products offer a number of advantages over modified high-end units, such as an array of diagnostic LEDs to help with troubleshooting in small offices that do not have on-site technical staff.

Another class of products can be seen in the PC-based routers from Eicon Technology, Newport Systems Solutions and the like. This gear typically consists of a PC platform, WAN adaptor, and routing software (most often, Novell's Multiprotocol Router). A third group of products — dial-up routers — come courtesy of US-based vendors like Centrum Communications and Shiva Corporation. These manufacturers are newcomers to the router market, having made their names selling communications servers and LAN modems geared to single users. In essence, vendors in this group have modified their original products, adding LAN-to-LAN connectivity over dial-up switched circuits. It should be noted, however, that while proprietary and PC-based routers generally use leased lines, many vendors are looking to add dial-up service to their boxes.

Critical Concerns

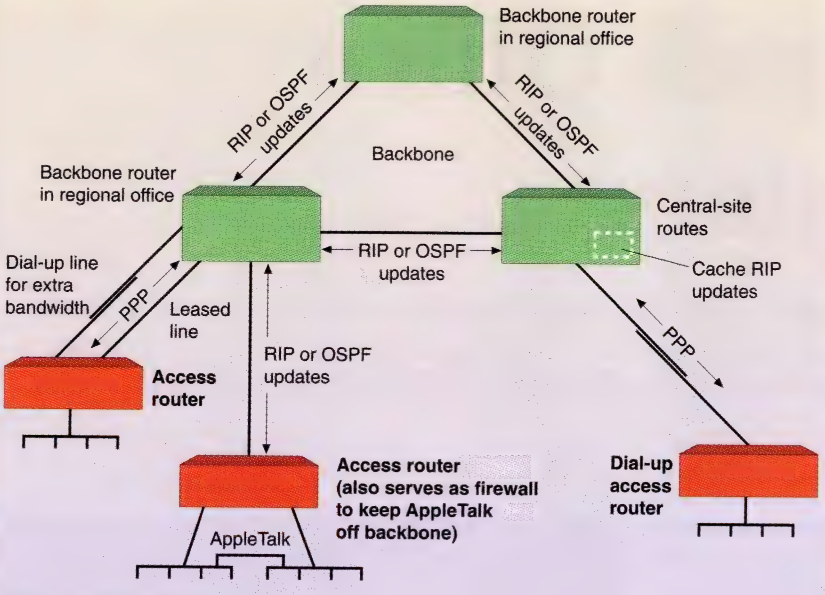
Given the number of vendors crowding the market, there are bound to be very real issues that must be assessed if intelligent decisions are to be made.

Interoperability is at the top of the list. A large number of suppliers in this market only sell access routers, which means that their products will be paired with another supplier's internetworking gear. On the surface, this looks to be fine; the IETF (Internet Engineering Task Force) developed PPP (point-to-point protocol) to ensure that any two devices connected over a serial link will work together.

Unfortunately, PPP implementations are not uniform, which means that it's possible to be up to spec (at least according to the letter of the law) without guaranteeing compatibility.

Access is of the Essence

Access routers give employees in branch offices a way to tap into the corporate backbone - and all attached resources - via leased lines or dial-up connections. They also can be used to keep chatty protocols like AppleTalk off the corporate network, protection not afforded by modems and bridges.



OSPF = Open Shortest Path First
PPP = Point-to-Point Protocol
RIP = Routing Information Protocol

Another issue of critical concern for network managers is how backbone routers deal with dial-up links. Internetworks are typically built with leased lines, and router-to-router protocols look for permanent connections when they set about calculating paths through the network. Dial-up lines, by definition, are impermanent (they are only deemed to 'exist' when they're carrying traffic), which plays havoc when an administrator attempts to establish a meaningful map of the network.

Price is another critical consideration (as always) but many network managers are looking beyond list price and starting to factor in what's being called the 'cost of ownership.' Specifically, they're taking into account labour charges associated with installing and managing the router, as well as the recurring cost of connecting access routers to a central site.

Finally, since access routers are going to be deployed far from the watchful eyes of network personnel, security is shaping up to be a big issue. Cisco Systems has already moved to address this concern with the announcement of security enhancements to its CiscoWorks router management application suite. The software's new Security Server feature will use the access security protocol known as TACACS (Terminal Access Controller Access System) to provide server-based password authentication, and, via an agreement with US developer Enigma Logic, Cisco will also add to its product range server-based token authentication, which utilises a credit-card-sized password calculator.

But why bother with access routers at all, especially if choosing the right equipment looks as if it could help drive a network manager's blood pressure into the danger zone? Modems and bridges are far simpler to use, it's true. But the former are often too slow to handle LAN traffic, while the latter offer no protection against the broadcast storms that can bring down an entire backbone.

That's why an access router, with its ability to filter traffic and keep it confined to the branch office LAN, is essential (see the figure above).

Pick and Choose

As a class of products, access routers generally offer moderate performance at a low price. But for vendors to get prices down to an acceptable level — so companies can afford to deploy branch office boxes as needed — they've generally had to scrimp on features found on higher-end units.

The place to start when selecting an access router is with the network and applications the product will be paired with. Scaled-down proprietary boxes, PC-based gear, and dial-up equipment all offer connectivity, but each is best suited to different environments. Proprietary access routers typically differ from their full-scale counterparts by offering fewer LAN and WAN ports. Unlike backbone routers, these units are neither modular nor expandable: it's not possible to add ports or change the port type simply by swapping one card for another.

On the plus side, these scaled-down boxes tend to support far more LAN protocols than do rival branch office routers. Companies like Cisco and Proteon already accommodate AppleTalk, DECnet, IP, IPX, and XNS (among other protocols) on their central site routers, so it's not surprising to see the same sort of support on their smaller offerings.

PC-based routers, in contrast, usually handle only IP and IPX. But these devices accept additional LAN and WAN adaptors, so the number of ports is not fixed. That makes it possible to start small and expand as a network grows. And PC-based products are built on familiar platforms and typically employ the same command structure as popular network operating systems. Thus, inexperienced or less technically skilled network administrators in branch offices should be able to set up PC-based products without too much hassle.

Dial-up routers, for the most part, offer one LAN connection and one WAN port (for a modem or ISDN terminal adaptor) to link to the public switched network. Dial-up routers are best for what's known as casual connectivity, which is generally defined as no more than four hours of traffic a day. Some of these products are the handiwork of inverse mux vendors who are using their technology to build access routers that allow users to increase the bandwidth between sites by dialling up several lines and multiplexing signals.

Despite these types of limitations, however, branch office routers are not that bad when considered in light of the offices that they're destined for. Most small sites only run one or two networking protocols and need only a couple of local area networks. When more networks and protocols must be accommodated, a mid-sized router like the Proteon CNX400 would be a better match.

Network managers also have expressed concern that access routers can't deliver the performance of their larger counterparts. Bear in mind, though, that the traffic levels from branch offices will usually be fairly low, and it's far more likely that the WAN links will prove more of a bottleneck than the access router.

All Quiet on the Backbone

But there's more to picking an access router than just matching speeds and feeds. Since this gear is going to be added to an internetwork, net managers need to be sure from the start that the product they pick doesn't disrupt the backbone.

There are two key issues to consider here. Making sure that access routers are compatible with the backbone routers already in place is the primary concern. And with the growing reliance on dial-up con-

Assessing Access Routers

VENDOR	PRODUCT	TYPE	LAN PROTOCOLS	ROUTER-TO-ROUTER PROTOCOLS	WAN PORTS MAX - TYPE	LAN PORTS (MAX)/TYPE
3Com (02) 959 3020	NETBuilder Remote	Proprietary	AppleTalk, XNS, DECnet, IP, IPX	Integrated IS-IS, RIP, OSPF	2 - X.21, X.25, V.35, frame relay, ISDN	2/Ethernet, Token Ring
	NETBuilder Remote Office	Proprietary	AppleTalk, XNS, DECnet, IP, IPX,	Integrated IS-IS, RIP, OSPF	1 - X.21, X.25, V.35, frame relay, ISDN (plus backup WAN port)	1/Ethernet, Token Ring
Accsys (02) 299 2799	Tokenmaster Series	Proprietary	IP, IPX	OSPF	4/V.35, X.21, frame relay	1/Token Ring
Adacom Network Routers Dataplex (03) 210 3333	L2SR/Model 3000	Proprietary	IP, IPX	RIP, OSPF	8 - X.25, V.35	2/Ethernet, Token Ring
Advanced Computer Communications ADE (03) 543 2677	ACS 4100, 4200	Proprietary	AppleTalk, XNS, DECnet, IP, IPX,	RIP, OSPF	4 - X.25, V.35, X.21, frame relay	2/Ethernet, Token Ring
	Nile	Proprietary	AppleTalk, XNS, DECnet, IP, IPX,	RIP, OSPF	2 - X.25, V.35, X.21, frame relay	1/Ethernet, Token Ring
Andrew Corporation (03) 357 9111	Pathwise 6100, 6200	Proprietary	AppleTalk, XNS, DECnet, IP, IPX	RIP, OSPF	6 - X.25, V.35, X.21, frame relay,	3/Ethernet, Token Ring
Ascom Timeplex (02) 247 1422	Access Router	Proprietary	AppleTalk, XNS, DECnet, IP, IPX	RIP, OSPF	5 - X.21, X.25, V.35, frame relay	4/Ethernet, Token Ring
Centrum Coombes Technology (02) 418 8022	Centrum Remote	Dial-up	IP/IPX	RIP	16 - X.25	1/Ethernet, Token Ring
Cisco Systems (02) 957 4944	Cisco 2500	Proprietary	AppleTalk, XNS, DECnet, IP, IPX, VINES	IGRP, RIP, OSPF, ES-IS, IS-IS	3 - X.21, X.25, V.35, frame relay, ISDN	2/Ethernet, Token Ring
Cray Communications (02) 451 6655	Cray Remote Router	Proprietary	DECnet, IP, IPX	RIP	8 - X.21, X.25, V.35	1/Ethernet
Develcon Electronics Anderson Network Corp. (02) 838 7755	Model 300	Proprietary	IP	RIP	2 - V.35	1/Ethernet
DEC (02) 561 5252	DECrouter 250	Proprietary	DECnet, IP	RIP, Integrated IS-IS	8 - V.35	1/Ethernet
D-Link Systems Kincolith (02) 977 4466 Hardie Networks (03) 890 0900 Toren (03) 242 5000	Smart Route	Proprietary	IP, IPX	RIP	2 - X.25, V.35, frame relay	2/Ethernet
Eicon Technology JNA (02) 417 5837	Router for NetWare	PC-based	IP, IPX, AppleTalk	RIP	16 - V.35, X.25	2/Ethernet, Token Ring
Gandalf Systems CTEC (02) 975 4722	Access Router Series	Proprietary	IP, IPX, DECnet, AppleTalk	RIP, OSPF	2 - V.35, X.21	2/Ethernet
Hewlett-Packard 13 13 47	HP Router Series	Proprietary	AppleTalk, XNS, DECnet, IP, IPX	RIP, OSPF	3 - X.21, X.25, V.35, frame relay, ISDN	2/Ethernet, Token Ring
Hughes Network Systems GECAIT (02) 415 0500	PCrouter	PC-based	IP, IPX	RIP	2/X.21, X.25	1/Ethernet, Token Ring
IBM 13 24 26	Routexpander	PC-based	IP	RIP	2/X.21, serial	1/Ethernet, Token Ring
Idea IDE Technology (02) 899 9900	Idea Comm Brouter	PC-based	IP, IPX	RIP	2 - X.21, V.35	1/Ethernet, Token Ring
Micom Datacraft (03) 727 9111	Marathon	Proprietary	IP, IPX	Proprietary	12, serial	12 Ethernet
Network Application Tech. ADE Network Technology (03) 543 2677	Remote IP Router	Proprietary	IP, IPX	RIP	X.21, V.35	1/Ethernet

Assessing Access Routers (Cont.)

VENDOR	PRODUCT	TYPE	LAN PROTOCOLS	ROUTER-TO-ROUTER PROTOCOLS	WAN PORTS MAX - TYPE	LAN PORTS (MAX)/TYPE
Network Dynamics Interlink Communications (02) 975 2577	Outer Router	Proprietary	TCP/IP, IPX, X.25, DECnet, AppleTalk	RIP, PPP, OSPF, IS-IS	2 - X.21, frame relay, RS232, RS530, V.35, ISDN	2/Ethernet, Token Ring
Network Systems Corp. Techway (02) 975 2122	6600	Proprietary	AppleTalk, XNS, DECnet, IP, IPX	RIP	32 - X.25, V.35, frame relay	4/Ethernet, Token Ring
Newbridge Networks Datacraft (03) 727 9111	Mainstreet Ethernet Router	Proprietary	AppleTalk, DECnet, IP, IPX	RIP, OSPF	4 - X.21, X.25, V.35, frame relay	1/Ethernet, Token Ring
Newport Systems Solutions LAN Systems (02) 901 3655	LAN2LAN/MPR and Megarouter	PC-based	IP/IPX	RIP	12 - X.21, X.25, V.35, ISDN	4/Ethernet, Token Ring
Novell (02) 925 3000	NetWare Multiprotocol Router 2.1	Software only	AppleTalk, IP, IPX	RIP, Integrated IS-IS	16 - X.21, V.35, ISDN	16/Ethernet, Token Ring
Plexcom ADE Network Technology (03) 543 2677	8028	Proprietary	AppleTalk, DECnet, IP, IPX, XNS	RIP	1 - X.21, X.25, V.35, frame relay, ISDN	1/Ethernet
Proteon (02) 955 8555	DNX 300 Series	Proprietary	AppleTalk, DECnet, IP, IPX, XNS	RIP, OSPF	2 - X.21, X.25, V.35, frame relay, ISDN	2/Ethernet, Token Ring
RAD Network Devices Toren (03) 242 5050	Opengate OG-MAR	Proprietary	DECnet, IP, IPX	RIP, OSPF	2 - X.21, X.25, V.35	1/Ethernet, Token Ring
Retix (03) 563 4333	Remote Bridge/Router	Proprietary	DECnet, IP, IPX	RIP	2 - X.21, X.25, V.35	1/Ethernet
Shiva Connexus (02) 975 2799	Netmodem	Dial-up	IPX, AppleTalk	None	8/V.32, serial	1/Ethernet, Token Ring
Telebit Dataplex (03) 210 3333	Netblazer	Dial-up	IP, IPX, Appletalk	None	2/serial	1/Ethernet
Wellfleet (02) 955 2955	Access Feeder Node	Proprietary	AppleTalk, DECnet, IP, IPX, XNS	RIP, OSPF, Integrated IS-IS	2 - X.21, X.25, V.35, frame relay	2/Ethernet, Token Ring
Xyplex NetArch (07) 393 1933	Maxserver 6220 Remote	Dial-up	AppleTalk, DECnet, IP, IPX	RIP, OSPF	2 - X.21, X.25, V.35, frame relay	1/Ethernet

CLNP = Connectionless Network Protocol
IGRP = Interior Gateway Routing Protocol
IP = Internet Protocol
IPX = Internet Packet Exchange
IS-IS = Intermediate System-Intermediate System
OSPF = Open Shortest Path First
RIP = Routing Information Protocol
XNS = Xerox Network Services

nections to the central site, it's also essential to know how backbone routers will deal with connections that are set up and torn down on demand.

Interoperability has gotten most of the press, in part because of the large number of new vendors in this market (most of whom do not make backbone routers of their own). Although it's true that the IETF's PPP standard for interoperability has been wholeheartedly adopted by the industry, compatibility is far from a sure thing.

In essence, PPP is a WAN encapsulation scheme that specifies how data is to be exchanged over a serial connection (see 'PPP: Not-So-Delicate Negotiations' on page 74). PPP defines framing formats and governs the way two routers establish a session, monitor the link, and terminate the session. It also has some advanced functions, such as compression and security.

The IETF has tried to make PPP as flexible as possible. The protocol actually enables two routers to negotiate a common set of parameters (such as packet size) that govern a particular exchange. The ability to negotiate means that vendors don't have to implement the full suite of IETF specifications for their products to work together —good news, since the point-to-point protocol is very rich in features; the full spec is laid out in 10 RFCs.

The bad news for prospective buyers is that router vendors can support a stripped-down version of the protocol while still claiming (completely legitimately, it must be said) that their products are PPP-compliant. Users have no way of knowing if products from different vendors really have any features in common.

If they don't, there's no room for negotiation, and data cannot be passed over the link. And even if an access router and its more sophisticated central site equivalent are compatible, unless they're both from the same vendor, proprietary features will be unavailable.

Dialling for Data

Network managers also need to be aware of how their central site routers are going to interact with dial-up connections. Remember, the majority of internetworks are conventionally built around leased lines, which are either available or failed. Router-to-router protocols — such as RIP (routing information protocol), OSPF (open shortest path first), or Cisco's proprietary IGRP (interior gateway routing protocol) — are designed to identify failed links and recalculate paths accordingly.

Dial-up networks are another matter entirely: unavailable links are not necessarily synonymous with failed links. It may simply be that the connection has been torn down since there's no data to send.

But router-to-router protocols can't tell the difference between a failed line in a leased network and an inactive (hence nonexistent) link in a dial-up network. Thus, if a backbone router sends a probe packet to test a dial-up link and gets no response, it assumes the line has gone down and duly informs all the other routers on the network of the failure. These boxes, in turn, recalculate paths accordingly.

Most vendors say the way around this issue is to let the boxes on the backbone use router-to-router protocols to communicate while the access router and its partner use PPP. In essence, the internetwork routers simply ignore dial-up connections.

For instance, if a company has regional offices in Sydney, Adelaide and Melbourne connected by leased lines, and a branch office in Ballarat (Victoria) linked via dial-up line to the Melbourne office, the paths between the regional offices can be determined by RIP, OSPF, or IGRP. When the router in Ballarat needs to access the backbone, it uses PPP.

With this approach, the traffic headed for Ballarat is terminated at Melbourne (at least as far as the router-to-router protocols are concerned). The routers in Melbourne and Ballarat then set up a separate session.

One downside to this routing scheme is that it requires a little more effort to manage. If all the links were leased lines, the common routing table used to direct traffic would contain the addresses of all the nodes on the network. When dial-up lines are involved, though, two routing tables must be maintained.

Hello Out There

Another issue to consider with dial-up networks is how access routers are apprised of the state of the network. Router-to-router protocols rely on periodic updates. RIP, for example, typically exchanges routing information every 30 seconds. When an expensive high-speed leased line is used to connect sites, that's not a problem. But with a low-speed dial-up link, routing updates can consume a significant portion of available bandwidth.

What's more, it makes little sense to go to the trouble of establishing a dial-up link every 30 seconds simply to send routing information between sites.

Some router vendors and users have turned to various forms of spoofing to try to get around this problem, fooling their routers into thinking that traffic can always travel from the branch office to a node anywhere on the internetwork.

Centrum Communications caches RIP updates at the central site, making it available to a remote router as soon as it dials in. But this is a proprietary approach. If Centrum equipment isn't being used at both ends of the link, the access router is in the dark when it comes to the current state of the network. Unfortunately, there's no consensus on the best way to do spoofing. And some access router vendors think that the task should be left to central site gear. Help may be on the way. Spider Systems has submitted a draft to the IETF's Network Working Group that seeks to standardise the way RIP updates are handled when dial-up circuits are added to an internetwork. It suggests a 'triggered update mechanism' that only passes routing information when a dial-up link is set up.

So much for RIP. OSPF, in contrast, either sends router updates when something on the network has changed or transmits less frequently (typically on the order of five minutes). But if the dial-up link is inactive, OSPF still can't reach the access router. A few network managers have reset the OSPF timers for far longer intervals (say, 30 minutes). This way, when the timer goes off, the central site router simply dials

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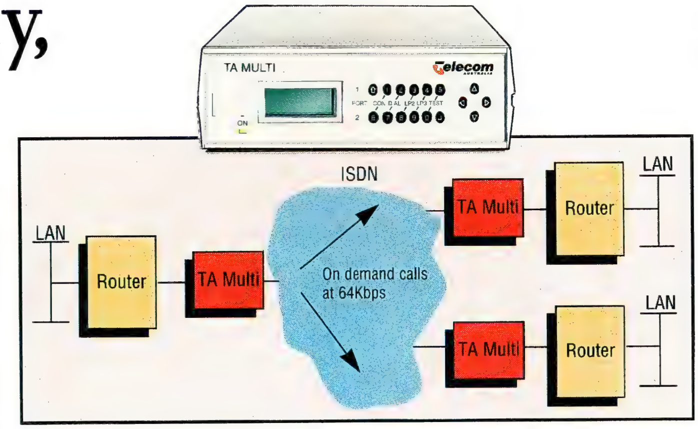

Since Telecom's ISDN Microlink service has been available, Telecom Australia has supplied, maintained and installed a range of Microlink terminal adaptors (TA's) - providing high speed data transmission.

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up the branch office and passes the update information to that site. The trouble is that tinkering with the timer can cause path convergence problems in a large internetwork.

Another way to handle dial-up connections is to assume that the link is okay unless an actual attempt to dial it up ends in failure. The trick is how to get OSPF routers to do this. At this point, there's no agreement on how this scheme is to be implemented. Dial-up connections on internetworks, in fact, are so new that the issues to be addressed are still being determined.

Beyond the Bottom Line

Price is always a concern on internetworks, but access routers are redefining the way net managers cost-justify products and purchases. It's ironic that the number of vendors in this market — which makes interoperability such a hot issue — also is helping to drive down list prices.

But the sticker price is just the starting point for savvy network managers. They're also looking at the hidden charges associated with installation and management, as well as ways to trim the recurring telecom charges racked up by branch office routers.

These can be very significant: a study by US market research firm Dataquest found that the purchase price of an access router only accounts for one-third of the so-called lifetime costs of ownership. The other two-thirds go (primarily) to line charges and (secondarily) toward the salaries of the people who take care of this equipment.

Access router vendors have come up with a variety of ways to cut the cost of ownership. Most have tried to make installation easier, which can add up to big savings for a company that has to deploy hundreds of access routers at sites where employees may not have the technical expertise to configure internetworking gear.

One way that suppliers are seeking to ease installation is to build their products on platforms already familiar to users — namely, PCs. The theory is that PC-based routers are easier to set up and oversee (in this case, familiarity breeds content). These products usually comprise a communications card and Multiprotocol Router software from Novell. Many PC-based routers also use the same onscreen interface as NetWare, which means that a branch office LAN manager doesn't have to learn the cryptic command line instructions once employed with boxes from Cisco, Proteon, Wellfleet, and the like.

Vendors of proprietary access routers aren't going to be outdone that easily, though. Many have simplified the once-arcane configuration commands used to set up their boxes or do the heavy labour for the customer before shipping the product.

Proteon, for example, has network managers fill out a simple order form for its DNX 300m, specifying, among other information, what LAN and WAN ports they'll need and which protocols must be supported. The vendor uses this information to preconfigure the router; that way users only need to enter a few pieces of information (such as IP addresses) to get the router up and running.

3Com and RAD Network Devices have tried to make configuration even easier. By modifying their routing software, both companies have been able to move most of the intelligence to the central site router. That makes the device at the remote site much simpler and thus easier to use.

In essence, what 3Com and RND have done is exploit the fact that most branch offices only have one WAN connection. A conventional router performs two basic tasks: it determines whether to forward a packet and it decides which router port to send it to. With only one WAN port, the branch office router doesn't have to bother with the second decision.

Cisco took another tack when it came to configuration. Realising that there's a lot duplication of effort involved in setting up access routers in different offices, Cisco developed an auto-installation process that lets parameters developed for one router be assigned to an entire group.

Cisco's approach is analogous to the way LAN managers now assign access rights to groups of users. It saves time because net managers no longer have to enter the same information over and over. If a company uses RIP to route IPX traffic from remote sites, the network manager need only enter the default settings associated with the protocol once and then transfer the settings over the network to all access routers using Cisco's management program.

No More Door-to-Door

Still, once an access router is installed it has to be maintained and managed. This can run into big money if tech support personnel are dispatched out to each and every branch office whenever there's a problem or even a straight upgrade. According to California-based Infonetics Research, 75% of the network managers at 100 companies surveyed want centrally managed access routers. In the past, for instance, every time a new release of a vendor's routing software was issued, technicians had to visit each router and swap in the new firmware or go from router to router with a disk and manually install the new algorithms.

Chip replacement and disk-based updates were not a major problem when only a handful of routers had to be serviced. But with hundreds of access routers, the process is at best tedious and at worst a serious financial burden. Right now, many access routers use flash EPROM (erasable programmable read-only memory) to store routing software. This allows updates to be downloaded all at once over the network, 3Com and RND have made upgrades easier still. With their centralised approach to routing intelligence, virtually all changes in software only have to be loaded onto backbone gear.

Besides reducing labour charges, access router vendors have come up with a number of other ways to keep line costs down; including data compression. Without a doubt, companies want to squeeze the most out of the low-bandwidth lines they use to connect to remote sites. Among vendors offering compression on their access products are 3Com, Advanced Computer Communications (ACC), Andrew Corporation, Newport Systems Solutions, and Retix.

Most compression comes courtesy of proprietary variations of the Lempel-Ziv algorithms, which identify redundancies in data and only send information over a WAN link once. Depending on the type of data being sent, these algorithms can compress data to half its original size or less.

The drawback to data compression is that it's strictly proprietary. So a company must use routers from the same vendor to reap the benefits.

Pay As You Go

Bandwidth on demand — the ability to use dial-up lines to supplement leased links — represents another way to cut the cost of ownership. This scheme allows a company to use leased, lower-speed connections for normal traffic loads, only dialling up additional lines to offload peak traffic.

This should not be confused with routers that only utilise dial-up connections to link sites. Most access routers that offer bandwidth on demand rely on leased lines for their primary links and dial-up circuits to add throughput when needed. Typically, the router monitors the traffic, dialling up an additional line when it exceeds a preset limit. Most often traffic is balanced between the leased line and the dial-up line using inverse multiplexing. When the load drops below the threshold, the dial-up connections are torn down. Some straight dial-up routers also allow bandwidth to be added by dialling up lines.

Some users also want dial-up lines available as backup, serving as auxiliary links when leased lines go down. This is a lot cheaper than the conventional method of backup, in which spare leased lines sit idly by for the majority of the time. Relying on switched circuits for emergency connections allows companies to reduce the number of leased lines to each site and only pay for emergency dial-up links on an as-needed basis.

Still other users — who only have to connect to the backbone for a few hours each day — are looking to eliminate leased lines entirely. These offices only need what is known as casual connectivity, which gives them a chance to exchange e-mail and occasionally transfer files or access host

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PPP: Not-So-Delicate Negotiations

The point-to-point protocol (PPP), as defined by the Internet Engineering Task Force (IETF), establishes a standard way for routers to set up a session, monitor the link, and terminate a session. It also includes packet-framing formats, along with some advanced functions such as IP header compression and security.

The routing protocol has three main components: a method for encapsulating data over serial links (the default framing is based on HDLC (high level data link control); a link control protocol (LCP) that initiates, configures, and tests the data link connection: and a set of network control protocols (NCPs) that determines how to handle network layer transactions.

PPP is based on an earlier point-to-point protocol, SLIP (serial line IP). SLIP however, is not a standard, which has led to interoperability problems among different vendors' gear. In essence, SLIP spells out a way to encapsulate data in IP packets so that they can be sent across point-to-point links. But it offers no way to determine what type of packet is being passed over a link (there is no packet-type field in a SLIP header). That means a SLIP link is limited to one protocol at a time. That is okay in some cases, but many companies have traffic that consists of at least two, and often three or more, protocols. SLIP also has no way to detect or correct link errors.

PPP is intended to rectify these shortcomings and offer a standard approach to serial connectivity. But there's a problem. PPP is defined in 10 RFCs, and vendors are allowed to choose which features and functions they will support. The intent here is to create a robust specification with some leeway as to implementation.

Unfortunately — for the user — vendors can support only one RFC (or even a subset of a single RFC) and still claim that their products are PPP-compliant. This is where interoperability issues come to the fore: If an access router's PPP feature set doesn't match that of the central-site router, the two may not work together. In fact, no matter what vendors may claim, the only way to ensure that routers from different suppliers are compatible is to try them out before buying anything.

This problem is ironic, given that PPP is supposed to let vendors pick and choose the features they accommodate. To help achieve this sort of freedom and still maintain interoperability, devices connecting via PPP go through a negotiation process before data is passed between sites. When two routers attempt to link up using PPP, each announces to the other which features it supports. The routers then agree to use a common set of features for their communications: (Of course if the two have nothing in common there is no way for them to communicate).

For network managers, the best part of PPP is that negotiations are handled automatically. The router initiating the connection sends an LCP requesting that a link be established. The receiving router responds with an acknowledgment LCP. This lets both boxes know that the link is up and data can be passed over it.

Next, LCPs are exchanged that specify which encapsulation format to use and whether any compression or authentication is to be employed. This is the start of the real negotiations. For instance, one option with PPP is to use IP header compression. This saves bandwidth by reducing the redundant information in successive IP packet headers. Some vendors, however, may choose not to support this feature since it adds to the cost of the router (it requires more processing power and memory). If both routers support IP header compression, each will use it; if only one router does, then the two will agree to communicate without compression.

After the link-layer negotiations are concluded, the routers must agree on how the network layer protocols are to be handled. To do this, NCP packets are exchanged and the routers automatically determine which network protocols are being used on each end of the link.

PPP also gives network managers two options when it comes to security: password authentication protocol (PAP) and challenge handshake authentication protocol (CHAP).

PAP performs a one-time authentication when the link is established. A router initiating a connection keeps sending its ID and password until the central site router either authorises the connection or terminates. The trouble with this approach is that the access router doesn't encrypt its ID and password, which means they could be intercepted. For net managers who have not established any security for their access routers, PAP is a good first step. If more protection is needed, CHAP can be used. CHAP not only encrypts the identification information exchanged between routers but also periodically verifies the identity of the router connecting to the backbone.

Here's how it works: Once a connection is established, the backbone router sends a message to the branch office router challenging it to identify itself. The branch office router uses a hashing function to encrypt a password and sends it back. The central-site router knows the correct password, which it runs through the same hashing function. If the two match, the branch office router is authenticated. If the numbers do not match, the link is shut down. With CHAP, the password is never passed over the network.

Salvatore Salamone

databases and applications. Pure dial-up routing will save money if a site needs to be linked to a central location for no more than four hours a day.

Dial Now, Pay Later

But if dial-up service is really going to save money, companies need a way to keep track of line usage and bill charges accurately, much the way telephone charges are passed back to users. When leased lines were used, this sort of auditing wasn't nearly as important, since most companies simply absorbed the monthly fees as part of their operating budgets. If departments were billed back, the bill was usually divided up equally. With dial-up routing, in contrast, one department may only send e-mail while another regularly sends large files, so it's hardly fair (or good business sense) to take a share-and-share-alike approach to telecom expenses. Most access routers now offer some form of auditing, which can range from the rudimentary to sophisticated per-packet billing.

Finally, net managers are growing increasingly concerned about how to maintain security when access routers are far from the watchful eyes of trained staff. Like their full-sized counterparts, access routers can be used to keep users from going where they don't belong (filtering on source address, destination address, or networking protocol, for example). But technically savvy users could override filters by attaching a console to the management port on the router and reconfiguring it.

Opening up the backbone to dial-in access could also be asking for trouble, since a hacker could easily break into corporate databases and files. This is much the same problem that was encountered when modems first came into use.

Then, as now, the answer is authentication. To this end, the IETF has developed the challenge handshake authentication protocol (CHAP), which is a part of PPP.

And users who want to safeguard data that's carried over public networks will soon be able to encrypt data before it's shipped using DES (Data Encryption Standard).

Salvatore Salamone is Internetworking Editor for Data Communications magazine. He is based in New York.

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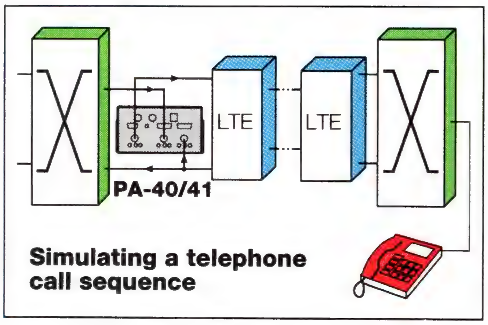

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- Digital Cross Connect testing
- Automatic Protection Switch testing
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Managing Global Networks

The worldwide development of new service and product options makes managing an international network a complicated task. Management tools, directory services and outsourcing can help.

Developments in telecommunications and information technology are having a significant impact today on both the way business is run and telecommunications networks are managed. Few organisations today can risk significant strategic moves without carefully examining the impact of IT and telecommunications on their business plans. Coinciding with an era of loosening regulatory restrictions and falling prices, these developments, which include new management tools, directory systems and the rise of outsourcing, are presenting new challenges for those charged with managing communications networks. And if this wasn't enough, where that network extends internationally, the ever-present encumbrance of operating in an environment partitioned by national boundaries and cultural and time zone differences presents its own challenges.

So the message is becoming clear: an ever-growing corporate dependence on telecommunications and IT requires communications managers with more than a passing level of business acumen. From an era when the responsibilities of a comms manager were limited primarily to managing PABXs, monitoring the performance of domestic and international leased circuits, passively reacting to increasing capacity requirements and reconciling communications bills, we now appear to be entering a period where the communications manager's role includes a new emphasis on business development, marketing and relationships with clients and suppliers.

Today, more than ever before, communications and IT managers are being drawn early in the planning process into consultation on major corporate strategic issues such as:

- How can telecommunications be used to improve productivity and efficiency?
- Which business requirements can be met by application-specific telecommunications solutions?
- How can telecommunications add value to a product or service?

While the communications manager, by definition, will never become accountable for a company's bottom line profit, and communications will always be considered a corporate overhead, we have an environment today where telecommunications, to a greater degree than ever before, has become a business driver. As a consequence, by virtue of the bottom line benefits offered by telecommunications, it is essential that the communications manager has an intimate knowledge of an organisation's primary business in order to effectively contribute.

The relationships developed between the communications manager and both clients and external service providers have also taken a new unprecedented turn over the past few years. With most large organisations today introducing internal user pays systems, the communications manager must now compete directly with external providers.

To justify its presence, the department managed by the communications manager must maintain a position of preferred supplier with corporate clients. In a telecommunications environment now open to competition for the provision of domestic and international

Table 1: A Sampling of Global Links

	AMP SOCIETY	BHP	CSR	PACIFIC DUNLOP	PIONEER INTERNATIONAL
PRIMARY BUSINESS	Insurance and money management	Mining, exploration, manufacturing	Building products	Manufacturing, marketing	Oil, petroleum and building products
OVERSEAS OPERATION	United Kingdom	Operates in many countries	Asia, USA and New Zealand	Asia Pacific, North America, Europe	Hong Kong, USA, Israel, Singapore, Thailand, Germany, Holland, Spain, China, Vietnam, Malaysia
INTERNATIONAL COMMUNICATIONS APPLICATIONS	Memo file transfer; Electronic mail	Financial consolidation; Electronic mail; File transfer; Videoconferencing	Mail; Upstream reports; Application support	Money market; Videoconferencing; Accounting; Global management	Financial reporting; Document file transfer; Electronic mail
INTERNATIONAL COMMUNICATIONS SERVICES					
■ Public Telephone	❑	❑	❑	❑	❑
■ Facsimile	❑	❑	❑	❑	❑
■ Public Packet Switching	■	❑	❑	❑	IVAN (Sprintnet)
■ Dial-up Modem	❑	❑	❑	❑	Via X.28 connection to Sprintnet from each o/s site
■ Private Lines	Yes - (IBM Info Net)	❑	■	Yes (some)	■
■ ISDN	Domestic only	❑	❑	❑	Domestic only
■ IVPN	■	❑	■	Yes (some)	■
■ LAN Interconnection	■	❑	■	Yes (some)	Domestic only
■ E-Mail	IBM Mail	❑	Yes (small amount)	Yes (some)	❑
■ EDI	■	❑	Domestic	Yes (Australia)	Domestic only
■ Videoconferencing	Domestic only	Yes (via ISDN)	Yes (ISDN to NZ and UK)	❑	Considering
■ Frame Relay	Evaluating	Not yet	No (anticipated)	■	■
■ ATM	Not yet	■	■	■	■
■ Other	E-mail only	Information services	CompuServe access	Information services	■
DIRECTORY SYSTEM	Local telephone and e-mail only	Proprietary e-mail and TIMSat, local sites, developing X.500 system	In-house and developing X.500	■	Australia-wide telephone and e-mail directories. No X.500 at present
NETWORK MANAGEMENT	NetView, LAN Manager (others under evaluation)	Limited number of systems; review enterprise systems	Currently undergoing re-evaluation	Various	Provided by Sprintnet
OUTSOURCING	IBM Info Net and all Australian IS Dept. mainframes and data networks to CSC	Voice VPNs; reviewing international data	No	Various	All international data communications via Sprintnet

❑ Yes ■ No

services, the communications manager is also faced with a new focus on forging strategic partnerships with external service providers and weighing up the economics and expediency of outsourcing.

As a salesman, the communications manager is beset with the task of describing, packaging and presenting telecommunications services in a manner understood by senior management. As a diplomat, the communications manager needs a grasp of an organisation's business ethics and corporate culture which exist both locally and overseas; particularly as it pertains to demarcation of responsibility for network development and maintenance.

Finally, as a facilitator, the communications manager must ensure that:

- There is a constant flow of information between external providers and users, so that telecommunications solutions effectively satisfy business needs;
- Network growth proceeds in a timely and non-disruptive manner; and
- Acceptable levels of network performance are maintained.

Australian Trends

The world is awash with telecommunications networks owned by telcos, service providers, global cooperatives, governments and corporations (for a review of the international services on offer to Australian

COMMONWEALTH BANK	NATIONAL AUSTRALIA BANK	WESTPAC
Banking	Banking and finance	Banking and finance
UK, US, Hong Kong, Japan, Singapore	Various international destinations	UK, US, Japan, Singapore, Hong Kong, New Zealand and South Korea
Money market; Foreign exchange	Many applications providing support to customers and internally within NAB	Money market; Foreign Exchange; Decision support; Credit proposals
☐	☐	☐
☐	☐	☐
■	Yes (dial and dedicated)	■
☐	☐	☐
Japan, Singapore, Hong Kong, UK, USA	UK, Singapore, Japan, New Zealand, USA, PNG	US, UK, Japan, Singapore, New Zealand
☐	☐	☐
■	■	☐
Internal	■	☐
Internal	Yes (Australia, UK, NZ)	☐
■	■	■
■	Yes (ISDN 386Kbps, UK, Australia, NZ)	■
■	■	■
■	■	■
N/A	Information FBEDS, IP Sharp	N/A
Nil	Electronic White Pages	Telephone and e-mail only
Various systems	NetMaster, Timeview 2000, NetView/6000	Timeview
One stop shop	Base support/maintenance of equipment. Managed radio and broadband circuits (Australia)	Not at present

users, see 'Going Global: Players, Products and Perspectives,' in the February 1993 edition). From the telephone network which links every country in the world through to corporate networks run by large multinationals, new applications are continually emerging and creating a demand for new services and new ways of managing change. The environment in Australia is typical to that in all other developed countries in the world. While the global corporate networks operated by the largest Australian-owned multinationals are dwarfed in comparison with those of the world's largest banks and industrial corporations, the issues confronting the Australian communications manager are no different to elsewhere.

A snapshot summary of the international telecommunications services used by some of Australia's largest and most well-known multinationals is shown in Table 1. Although it could be argued that this sample may not represent a true industry cross-section, it does serve to highlight some interesting trends. They are that:

- Only Australian banks tend to be large users of international private lines;
- No ATM or frame relay services are being used, although a number of organisations are evaluating frame relay;
- International LAN interconnection has not been widely embraced at this stage, and is most likely implemented, where present, using low to medium speed leased data lines;
- International e-mail is beginning to gain in popularity, particularly with those organisations able to carry it on spare private line capacity;
- International videoconferencing via ISDN is used fairly extensively and has largely replaced use of the more traditional Public Room services;
- While electronic data interchange (EDI) is used domestically by a number of organisations, it is only used internationally, at present, by BHP (and not by Australian banks);
- Internal development of X.500 corporate directories has commenced for a few organisations; and
- All organisations presently use a range of network management systems, with a few considering some rationalisation.

From the table it also appears that the networks established to support the offshore operations of Australian banks have typically taken the form of private lines carrying voice and data traffic for foreign exchange, money market and dealing room applications, e-mail and a number of lower traffic applications involving access to mainframe computers in Australia.

BHP, which can arguably be considered as having international telecommunications requirements and networking typical of Australian mining and manufacturing companies, relies principally on International Virtual Private Network (IVPN) services (Horizon and OTC Call Plan) for international voice communications and public packet switching for data transfer associated with financial consolidation, e-mail and general file transfers. It has no international private lines and is presently internally developing an X.500 corporate directory system intended to accommodate organisational information, company addresses, telephony details, electronic mail addresses, security for message authentication, legal accountability, and a number of customised user requirements.

Apart from the corporations listed in Table 1, a number of other Australian multinationals including Qantas and the Department of Foreign Affairs and Trade (DFAT), which are also significant users of international telecommunications.

DFAT is Australia's largest government user, with an internationally dispersed network comprising computing and data communications equipment, office automation systems and telephone facilities. The media used in reticulating its voice, data, messaging and image communications between Australia and 82 overseas posts, includes:

- Five high-speed international leased circuits (64Kbps) with plans for increasing to 13, including 1 x 128Kbps circuit;
- International X.25 networking provided by SITA;
- A number of medium speed (4.8Kbps and 9.6Kbps) leased circuits (particularly to S.E. Asia);
- Over 40 leased telegraph circuits operating at 75 and 110bps, which are planned to be replaced by X.25;
- IVPN; and
- HF radio.

By way of international traffic volumes (ignoring PSTN traffic), the DFAT network carries what has been estimated to be over 60% of all government communications into and out of Australia and is presently used in conveying a small proportion of non-DFAT government traffic. To guard against unauthorised interception of messages, the DFAT network has been designed with various levels of security to handle both 'Nationally Secure' and 'Non-Nationally Secure' communications.

All communications from Australia enter a DFAT node in Australia via a common access route. At the DFAT node, Nationally Secure messages comprise predominantly what, in DFAT parlance, are called 'cables' (formal messages containing government policy, instructions or advice), which are processed using high grade government encryptors and are routed over the Australian Diplomatic Communications Network (ADCNET). Other Non-Nationally Secure communications including data, voice, facsimile and some telex, are carried on the rest of DFAT's network. All international communications, apart from telex, are processed by commercial grade encryptors prior to transmission overseas.

While an Australian international diplomatic network has existed since 1945, developments over the years have provided increased capacity, functionality and security. Late last year the Department let two new three-year contracts for the provision of international telecommunications services between Australia and its 82 overseas posts. Optus, at a cost of around $2.5 million per annum, will be providing international leased circuits to 14 large posts, while Telstra, and subcontractors Sprint International and SITA, will be supplying IVPN and Private Packet Switching Network (PPSN) services respectively, for a cost of about $5.5 million per annum.

Qantas is one of Australia's largest corporate users of international communications with a global network comprising international private lines (up to T1 (1.5 Mbps)) and packet switched data and telegraph services provided by SITA. A number of large data centres in Australia provide the high levels of computer processing required by Qantas to handle engineering, maintenance, reservation system, flight planning, departure control and other decision support and ancillary applications.

Capacity on Qantas' international network is utilised predominantly by flight reservations traffic in the form of voice, data and electronic mail. Qantas links either directly, or indirectly, to all major Central Reservations Systems in the world, including SABRE in the United States and Galileo in Europe.

Management Tools

For telecommunications and IT, there is arguably nothing more complex than developing standards and systems for network management in an environment comprising demanding users and competing vendors. As far as the communications manager is concerned, tools are needed which:

- Monitor and control all equipment and applications in a corporate network, (regardless of vendor); and
- Enable the establishment of a full multi-level management hierarchy, where tailored summary reports can be passed up to higher management layers for presentation and further processing, as required.

Today, while the telecommunications and IT industry is beginning to experience some semblance of order, we have a complicated environment characterised by:

- Corporations with a high proliferation of computing systems (centralised and distributed), network components (mainframe computers, file servers, bridges, routers, multiplexers, packet switches, telephone exchanges, interconnecting circuits, etc.) and applications from different vendors all requiring some form of management;
- A number of internationally-sanctioned bodies which have developed network management standards;
- A number of vendor-based consortia including the Open Software Foundation (OSF) and the Network Management Forum (NMF) which are in the process of developing standards to both plug the gaps in ISO and ITU-T recommendations and position proprietary developments in the market place;
- Numerous network management systems developed, to differing degrees, on available standards; and
- Many vendors, which are rationalising developmental efforts through the establishment of inter-vendor alliances and licencing agreements.

The challenge for the communications manager operating in the present environment rests primarily understanding where the industry sits in terms of standards and what is available in the marketplace through unravelling the rhetoric of hungry vendors. A selection of enterprise network management systems and vendors is presented in Table 2 on page 82.

As far as these vendors are concerned, there is, at present, a flurry of activity associated with:

- Manoeuvring to adopt a preferred network management platform (their own, which will require on-going development, or that of another vendor); and
- Developing applications on management systems platforms from a range of suppliers to ensure that their devices can be managed by the broadest possible base.

With respect to the latter, applications for managing file servers, bridges, routers, building wiring, building security, telephone exchanges, etc., can be developed by an equipment vendor using development facilities provided by a management system supplier. The applications are typically developed on the Application Programming Interface (API) present on the management system.

As an example, Cabletron has recently announced a number of Portable Management Applications (PMAs) for HP OpenView, IBM Netview/6000, SunNet Manager and Novell NMS. The PMAs allow other vendors' network management systems to manage Cabletron's complete line of networking products. At this stage, hundreds of applications have been developed to manage network devices on various management platforms. As an example, 180 applications are currently available for HP OpenView, while another 220 applications are in the process of being developed.

A number of vendors, including NCR (AT&T), HP, IBM and Cabletron have also announced plans for developing systems which provide a 'Manager of Managers' function. In principle, the function is intended to support a 'Super Manager,' which treats the other management systems in a network as element level network devices. In the case of HP OpenView, for example, the 'Manager of Managers' product will support unlimited management levels and is expected to be released early this year.

As far as integrating directory systems into network management products is concerned, vendor's plans are still somewhat unclear. While the benefit of using X.500 distributed directory functionality for maintaining up-to-date equipment details and statistics for a globally distributed network has management potential, only a handful of moves towards integration have taken place to date.

Of all the concerns for a network manager, the desire to predict the future with respect to standardisation is most likely at the forefront.

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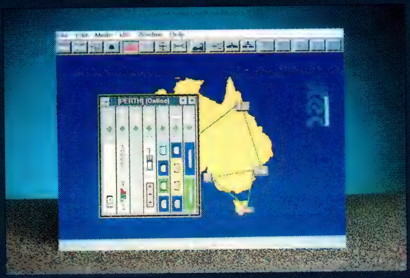

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Table 2: Enterprise Network Management Products

	CABLETRON SYSTEMS	DIGITAL	HEWLETT-PACKARD	IBM
PRODUCT	Spectrum	Polycenter Framework; Polycentre Network Manager 200 and 400; Polycenter NetView	HP OpenView	NetView, NetView/6000
MANAGER OPERATING SYSTEM	IBM AIX, DEC Ultrix, SunOS, Solaris, SGI IRIX	Polycenter NetView - DEC OSF/1 initially; others including Open VMS, Ultrix	HP9000, SunOS, Sun Solaris, Windows/DOS, IBM AIX	NetView - MVS, VM, VSE; NetView/6000 - AIX/6000
CLIENT COMPUTING PLATFORM	RS6000, DECstation, IRIS Indigo, Sparcstation, Crimson, Indy, others	Clients supporting management protocols	Windows, HP Apollo, Sun Sparcstations; Novell, Microsoft and Banyan platforms	NetView client using OS/2; NetView/6000; RISC workstation or client using X-Windows MOTIF sessions
MANAGEMENT PROTOCOL	SNMP V2 (beta), SNMP, CMIP (Alpha), PING, 802.1d, DEC MOP, SNA LU 6.2	DECnet Phase IV NICE, DECnet OSI CMIP, SNMP, 802.2/MOP	SNMP, CMIP, CMOT, DCE, SNA, Novell, DECnet	SNMP, CMIP, CMOT, SNA/MS and others through proxy agents
GATEWAYS	AT&T Accumaster, IBM NetView, Sterling Software NetMaster	Yes, via proxy agent	Yes, via proxy agent and communication infrastructure	Via proxy agents or service points
INTEGRATED DIRECTORY SYSTEM	Platform dependent (see IBM, DEC and Sun entries)	Digital Distributed Name Service (DECdns) provides global naming by Polycenter products. Migration to X.500 expected in the near future. No integration planned	Integrated X.500 directory system planned for second half 1994	Separate X.500 directory system currently available. Integration expected with DME evolution
DATABASE MANAGEMENT SYSTEM	DBVista - 00DB: supports multiple inheritance	Flat file structure. Facilities available for export to external relational database	Ingres (Oracle, Informix and Sybase second half 1994)	NetView/6000; Ingres, DB2/6000 (Q2 1994)
PROMOTED FEATURES (1)	AI engine provides intelligent alert filtering to a single point of failure	Consolidation and integration of tools across multivendor systems and networks	End-to-end network and systems management	Complete end-to-end management for network and computer systems
PROMOTED FEATURES (2)	AutoDiscovery supports a full network topology hierarchical view using router intelligence	Broad family of management applications and services	Scalable from low-end DOS to enterprise-wide open systems	Distributed and open management. Many vendor applications

While the OSF, through development of the Distributed Management Environment (DME, see 'Deciphering the DME Enigma,' in the November 1993 issue) appears to be setting an accepted course for a number of vendors, in practice, recent events would appear to suggest that budgetary constraints will most likely provide the ultimate stimulus for widespread industry conformance. As an example, IBM in developing its NetView/6000 product, began by procuring a source licence for HP OpenView. The licence permits IBM to license the product, and develop its own APIs and applications.

In addition, Bull, Hitachi and Data General have all announced plans to port OpenView to their respective platforms. Most of these vendors intend offering rebadged Hewlett-Packard OpenView management products this year. DEC, on the other hand, has announced a new joint engineering and development venture with IBM which includes porting the IBM NetView/6000 product to its Alpha AXP platform.

Should financial constraints continue to direct the course for the world's larger network management system vendors, regardless of which management system platform is adopted, there will theoretically be, in the short to medium term, an environment where a multinational corporation uses a single management platform which is independent of applications. The applications will be independently purchased from an equipment vendor, loaded and automatically integrated into the overall enterprise network management system.

Directory Systems

In recent times, developments in international standards for directory systems have, to a large extent, gone unheralded in comparison with publicity surrounding electronic messaging, frame relay, ATM, and other communications facilities. Nevertheless, the importance of effective use of directory systems for sourcing accurate local and international information cannot be understated.

For a multinational corporation, efficiency can be improved dramatically for the ordinary user by providing ready electronic access to telephone, e-mail or facsimile contact information for all local, domestic or international staff. Corporate sales managers dealing in the international environment require flexible access to client contact details. Communications managers are looking to a future where it is easy to link up with directories, domestically and internationally, which provide:

- The location and identity of corporate network users (clients of the communications manager); and
- Ready access to equipment vendor, service provider and other external party contact details.

Since 1984, organisations such as the ISO and ITU-T (formally CCITT) have been working on developing a set of international standards for distributed directory systems (see 'X.500 Electronic Directory Service,' in the December/January 1992-93 edition and 'Directory Systems for the Business Enterprise,' in the October 1993 issue). The new X.500 series standards are intended to:

- Permit access to information in physically distributed directories through a wide range of access methods; and
- Allow communication between proprietary directory systems through interface to a standard set of protocols and data structures.

There are presently a number of separate directions being taken by equipment vendors and providers of directory services. As

NCR	NOVELL	STERLING SOFTWARE	SUN MICROSYSTEMS
Starsentry	Novell Distributed Management	SOLVE: NetMaster	SunNet Manager
Unix V5.4	NetWare 4.0, 3.12 and 3.11	MVS/XA, ESA, SP, VM (SP, HPO, XA, ESA) DOS (VSE, VSE/SP), Fujitsu (MSP, FSP) Tandem Guardian, Hitachi VOS3	SunOS and Solaris
DOS, OS/2, Windows	Windows	IBM mainframes and compatibles	Sun Sparcstations
SNMP, CMIP, CMOT	SNMP over IP, Version 1; SNMP over IPX Version 1	SNA management services (NM VTS)	TCP/IP, UDP, ONC RPC, SNMP V1 & 2, DECnet, SNA, CMIP and proprietary
Yes, via proxy agent	No	SNMP to NMVTS	Gateway between SNMP/CMIP and proprietary protocols available 1994
Distributed directories in conjunction with OMNIpoint - mid 1994	Integration of Novell directory system and NMDS 2H 1994	Not at present	Third party X.500 directory providing console database. Possible integration of X.500 directory in 1994/95
Informix, Oracle	Btrieve	NetMaster database	NETISAM and Sybase, Oracle and Ingres (via third party)
Integrated system for network and systems management	Distributed management for server platforms; price and performance	Integration capabilities	SunNet Manager Solutions. Portfolio provides complete integrated solutions. Partners program provides robust set of third party products
Enterprise/Global Help Desk function	Snap-in modules to manage third party platforms	Peer management	One product at a low price provides both end user and developer functionality

a result of developments in directory standards, equipment vendors are positioning themselves to offer facilities which integrate a corporation's existing disparate directory systems and allow access, through standard protocols and interfaces, to directory systems of other external groups. On the other hand, service providers such as telecommunications carriers are, to a large extent, developing directory services in a bureau form, which will allow clients to access contact information included in public directories.

For both cases, the availability of international standards will allow the user to access a broad range of directory information as though all details were contained within a local directory system. In effect, international standards will permit corporate, public and external directories, from the perspective of the user, to be integrated.

From the perspective of the service provider, directory systems based on international X.500 standards are intended primarily to allow a user access to contact information. In practice, however, there is virtually no limit as to what information can be stored in an X.500 directory. Depending on design and application constraints imposed by a communications or IT Manager, an X.500 corporate directory system can be used as a document management system, a repository for voice or graphics information or to store equipment register details or computing application addresses.

The X.500 recommendations also lay the basis for global public directories. Following the establishment of appropriate multilateral agreements between service providers (particularly domestic and international carriers), there is the theoretical possibility that users will have access to a distributed directory for the entire world. While this is a vision for many theorists and implementors, in practice, such a facility is not expected to transpire in the short to medium term or without some technical and political trauma.

Security is a key requisite to establishing a globally distributed directory. Following the inaugural release of X.500 standards in 1988, which had little in the way of security features, a comprehensive portfolio of access control protocols has been provided in the 1993 Recommendations. These protocols supply the means for protecting directory information from unauthorised access or manipulation.

By way of available products, there have been a number of developments by vendors of directory systems based on X.500 in Australia and overseas. These include:

VENDOR	PRODUCT
Telecom	Corporate Electronic Directory (CED)
Telstra/Unisys	Telstra Enhanced Services X.500 Directory
Angeli Systems	Traxis Directory Service Engine
Isocore	Isoplex DS
Retix	Retix DX
OSF	DCE Directory
Isode	Quipu
Novell	NetWare 4.0 Directory Services

At present, there is no ITU-T defined specification for the user interface to an X.500 directory system and implementations are left to the discretion of vendors and other directory service providers. To date, access to commercially available X.500 directory systems for browsing and recovery of information has typically been through either character mode asynchronous terminals, or PCs incorporating a graphical user interface which allows a user to conduct an information search through systematically negotiating the limbs of a directory tree.

There are a number of international consortiums examining key aspects of remote user access and the practicability of interworking X.500-based directory systems. The most publicised of these is the North American Directory Forum (NADF) which has undertaken to trial the viability of exchanging proprietary e-mail directory information through a common X.500 data repository. This consortium was established in 1990 and at present includes Bellcore, Canada Postal Corporation, MCI, Advantis, BT, AT&T and Rapport.

For the vendors of X.500 directory systems, the single most pressing issue relating to widespread user acceptance has been remote access by means of a standard secure dial-up protocol. At present, standards are limited to specifying user access to an X.500 directory service through an interface based on the OSI stack (e.g. via a dedicated X.25 connection from a PC or LAN). The consortium is presently developing a series of specifications for secure protocols which will run over dial-up connections (such as X.28). At the moment, membership of the alliance comprises about 30 vendors, carriers and other international bodies, including Advantis, Apple, AT&T, BT, DEC, ICL, Inmarsat, Telstra, Tandem and Transpac.

Australia's first X.500-based directory system was developed by Telecom Australia. The directory system, called CED (Corporate Electronic Directory), runs on a Unix platform and is used as Telecom's internal corporate directory. For Telecom's application, it contains about 80,000 entries and at peak times, is accessed by almost 300 simultaneous users. At present, a number of other organisations in Australia are using the system, including ICI Australia and the Australian Government Publishing Service, which provides an on-line directory service for government users. Access to the Telecom product is via X.25, X.28 and TCP/IP.

A Telecom public directory service based on the X.500 standard is also currently under development. While there are virtually no published details available at this stage (including a release date), it is understood that access to the service will be via dial-up to a public interface and there are future plans for the service to be linked with directory services provided by overseas telecommunications carriers.

International Outsourcing

In the general sense, for the communications manager, outsourcing involves engaging an external party to perform particular functions which otherwise would have been performed by a Corporate Communications or IT Group. The rationale behind a corporation electing to outsource is, in practice, typically based on commercial considerations which may include:

- The requirement, in the short term, to raise working capital through the sale of telecommunications and/or IT assets; and
- Cost benefits and efficiencies in permitting a telecommunications/IT specialist to operate a corporate communications network.

For a corporation with global communications requirements, outsourcing may take the form of utilising the domestic and international managed network services offered by an International Value Added Network (IVAN) provider through to engaging an outsourcing agency to, in a number of countries:

- Take over the employment or management of corporate staff;
- Purchase or supply corporate computing and/or networking facilities; and
- Run the global corporate communications network.

Operational benefits which typically accrue from an organisation employing outsourced services from a single supplier include:

- Globally consistent service levels for network performance and circuit provisioning;
- A single worldwide point of customer service accountability;
- Simplification in dealing with time-zone differences and demarcation of network operational and maintenance responsibilities; and
- The availability of detailed, customised and if required, consolidated bills, which typically extend to include local carrier costs.

Outsourcing is provided in various forms, with providers generally specialising in particular service offerings. An example in point is the BT Managed Data Network Service (MDNS) Syncordia.

Having secured in September 1991 a contract to provide database and data network management services for the European travel reservation consortium Amadeus, BT announced plans to offer global One-Stop Shop services targeted at the world's top 40 companies. In a move touted as the world's first answer to providing a comprehensive global outsourcing service, BT has commenced the installation of a new IDNX-based network, to provide a range of end-to-end switched and dedicated data and image services. The network is to be established independently of its existing Tymnet-based GNS network, and managed through Network Control Centres in the US and the UK. To date, BT has secured major contracts to provide this service to subsidiaries and divisions within 4 multinational companies. In the Australasian region, the penetration of Syncordia is still in its infancy, with only BP Finance having taken out a managed link between Australia and the UK.

There is no doubt that the propensity for organisations worldwide to outsource is on the increase. While the Australian experience, to date, has been modest in relative terms, major corporate and government outsourcing opportunities for IVANs and IT outsourcers in Europe and North America, in recent times, would suggest that Australia should soon begin to see the emergence of similar trends. As an example, IBM has recently taken a step towards extending its US IT outsourcing business to Australia.

In the US, the IBM subsidiary Integrated Systems Solutions Corporation has an existing customer base comprising about 50 major contracts with companies such as Kodak, McDonnell Douglas, Hertz and Chase Manhattan Bank. A small number of these corporations have indicated a desire to outsource the operation and management of their IT facilities outside of the US to IBM. As a result of this and other strategic endeavours, IBM announced in October last year the formation of Information Systems Outsourcing Australia (ISOA), a fully owned subsidiary with plans to invest several hundred million dollars over the next five years, on people, computing assets and real estate.

In establishing a dedicated IT outsourcing unit in Australia, IBM has restructured its Australian operation by bringing together its Business Recovery, Information Network and Computing Centre groups. Technically, ISOA plans to invest heavily in IT infrastructure to strengthen its management capability for TCP/IP networks and non-IBM computing platforms.

In another major outsourcing development in Australia, US-based Computer Sciences Corporation (CSC) last November acquired Computer Services Australia (CSA) and, simultaneously, signed a 10 year, $450 million contract to take over AMP's Australian corporate data processing and communications facilities. As one of the world's largest IT outsourcing companies, CSC employs 26,000 people in 350 offices worldwide and generates revenue of $US25 billion annually.

Prior to the takeover, CSA had been fully owned by AMP and had provided a considerable level of outsourcing services to its parent. The new outsourcing contract constitutes the largest of its type ever let in Australia and forges a new relationship between AMP and CSA, which will be responsible for the management of all AMP's data and voice communications facilities, but will not purchase PABX equipment located in individual offices.

George Bakunowicz is an Associate and Business Manager, International Telecommunications, with Consultel Australia.

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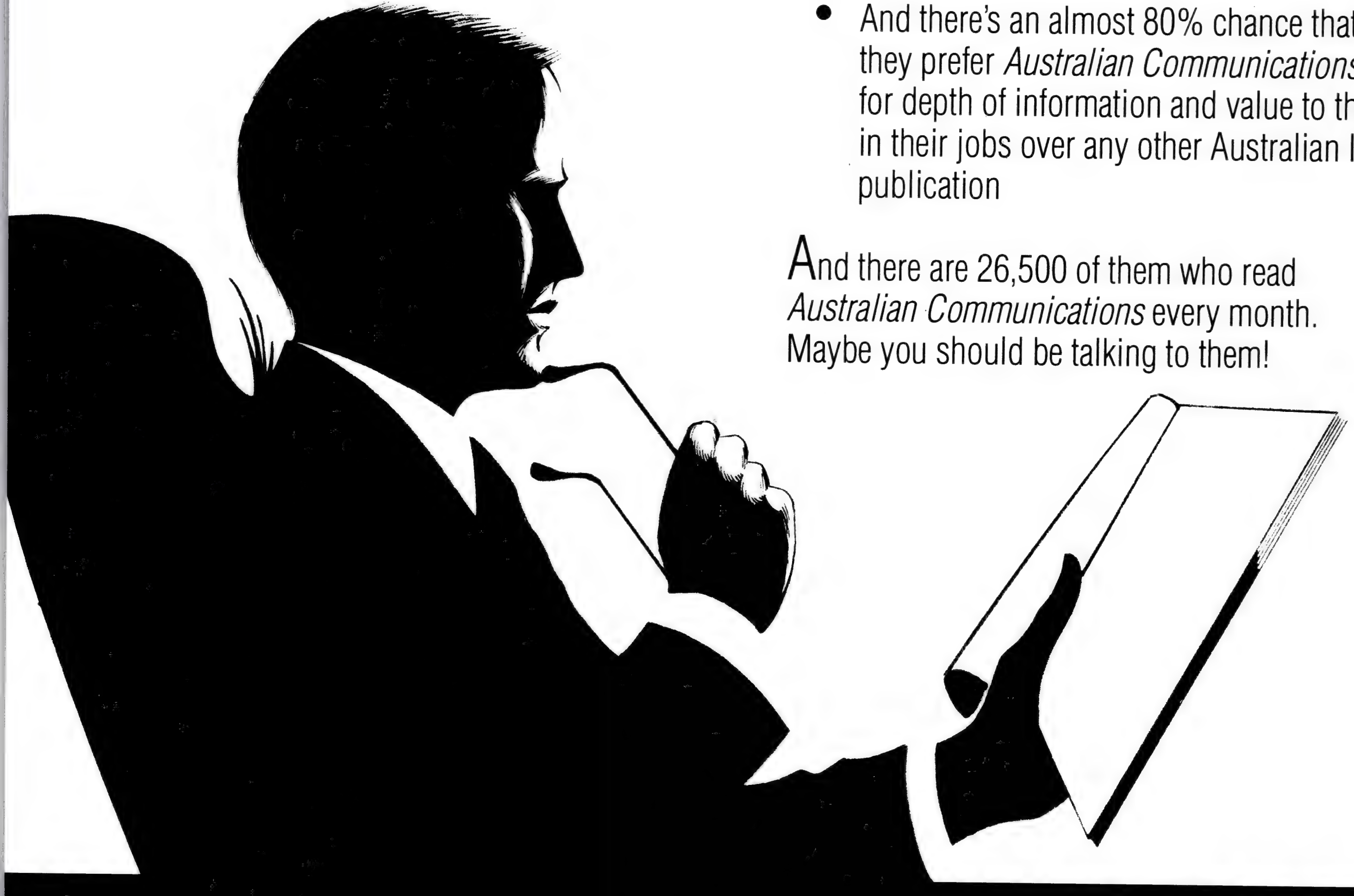

***All statistics are based on the response to the August 1993 *Australian Communications* readership survey conducted by Price Waterhouse, and *Australian Communications'* Audited Paid Circulation.**

For a copy of the complete survey results please contact Craig Burkill or Dawn Switzer on (02) 264 2200.

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Look Who's Calling Now

Starting this month, Telecom plans to trial Caller Line ID technology in the NSW town of Wauchope. Stewart Fist examines Caller Line ID functionality and the many issues its implementation raises.

Telecom must enjoy being at the centre of controversy: it's just opened a Pandora's Box of troubles. In the midst of its many other battles, Telecom has mounted the first trial of 'Caller ID' (actually Caller Line ID or CLID) in the NSW North Coast town of Wauchope. Perhaps they think that town is so hidden away from view that journalists and privacy activists won't notice?

More than 400 households and businesses in Wauchope will take part in the experiment, we are told. They'll only exchange caller-number identification between local users, of course, since this is a local experiment in one exchange only. The customer's add-on LCD display units will hold the last 20 call numbers in a buffer, and Telecom will also provide an automatic call-back facility. In the interests of privacy, Telecom is also offering to block the transmission of CLID on either a permanent or a call-by-call basis (where the caller needs to dial a prefixed non-delivery command code).

You can see where Telecom anticipates the potential profits from CLID; it is providing 10 businesses in the area with a personal computer fitted out with reverse directory software. Businesses can therefore identify the caller by name and, when coupled with the credit records, they can bone-up on the customer's sales and credit-records, etc. before the phone is picked up.

What wasn't announced is that this computer can also store the information and create electronic telemarketing directories for on-sale to other companies. Alternately, the business can use these lists itself to later harass their customers with unrequested sales and marketing calls.

Like many of these CLASS (Custom Local Area Signalling System) enhancements, CLID raises serious privacy, intrusion, and general social issues, which are complicated by the fact that the privacy issue flows two ways. It is a privacy issue if the carrier doesn't introduce CLID (assuming it can), and it's often a privacy intrusion if they do. There's a balance of rights here; the A-party (the calling party) has rights, and the B-party also has rights.

There are also potential problems at the periphery of these privacy issues; things to do with the cost of additional equipment needed to utilise these services and whether they become part of the 'universal service' concept; the on-going cost of these additional features (the carriers charge between $4 to $10 a month in the United States); and the cost and availability of secondary feature-services which are then made available to both the A- and B-party by the telecommunications carriers to defeat the primary Caller Line ID feature.

New Technology

The end-to-end delivery of the caller's telephone number before the telephone is answered has been made possible by the implementation of new digital switching technology — specifically by the CCS#7 signalling system — and it has been received in the United States with mixed reactions by the public, by the legal system in general, and by the courts in particular.

Caller Line ID Protocols

Different countries make use of slightly different Caller Line ID standards, but in general the sequence is:

- First ring-tone is transmitted;
- Line polarity is reversed;
- A dual-tone alert is put on the line for 20ms;
- The receiver puts both a DC and AC load on the line;
- One hundred or so alternating 'flag' bits are generated;
- Between 3 and 258 bytes of parameter data are transmitted using asynchronous (10-bit) FSK at 1200bps;
- Loads are removed and line polarity is reset; and
- The second ring-tone is transmitted.

The message format is: a) one byte indicating message type, b) one byte indicating length, c) up to 255 message/parameter bytes, d) checksum.

The standard parameter/message in the enhanced version has coded call-types; time and date; CLID number (up to 18 digits); code indicating why CLID is/not omitted; text-name or text string up to 20 bytes; coded reason why name is/not provided; message system status (indicating if stored messages are waiting in the telco's message system). Space has been left for later applications.

Stewart Fist

The caller's ID number is generated in the A-party's local exchange, delivered over the inter-exchange signalling system to the B-party's local exchange (in Wauchope this will be only a single exchange experiment) as packets on the normal signalling network, and then passed over the local loop to the B-party, generally in the form of analogue modem tones.

If the receiver of the call has the CLID feature enabled and the appropriate LCD-screen box alongside his or her phone, the local exchange will send the identification number across the local loop between the first and the second rings. Sometimes this data is delivered as a digital packet (in ISDN), sometimes as a modulated analogue stream (which some new modems can also read), and sometimes as DTMF (Dual Tone Multiple Frequency) audio tones, which Sweden is proposing to use for its CLID system.

ANI (Automatic Number Identification) is a similar system which is primarily designed to be used within the interexchange network (between carriers) to transfer billing information, but this data can also be made available to special corporate customers (specifically 800/008 customers) through DTMF tones. Where calls have been forwarded through an intermediate system (such as a company call-forwarding system) the ANI may not match the CLID. One is the billing number, while the other is the number of the caller's line.

There are a variety of CLID home displays now available in the United States. Some are independent boxes which attach to the normal phone line, some are built into the phones, and some have a direct side-feed to the serial port of a personal computer. Modems and PC software can also directly handle the analogue audio-tone form of most CLID transmissions. The current trend seems to be to use Frequency Shift Keying (FSK) at 1200 baud using 2100Hz and 1300Hz (V.23) in the United Kingdom, and the similar, but not identical, Bell 202T modulation in the US.

Actually, calling these display devices 'CLID displays' is now a bit of a misnomer. The displays and the protocols which are currently being defined and extended are intended to do more than just transmit a call-number plus time and date. Most standards provide for the transmission of names, data-type codes, and simple messages — so the standard is designed to duplicate some of ISDN's D-channel messaging advantages in the analogue local loop.

There are some very good and very useful features here. Currently CLID can provide a number (usually accompanied by time and date), but the 'Delux' Analogue Display Services Interface (ADSI) protocol extension will also carry the customer-name (extracted from the billing system), a data-type code (allowing the box to distinguish voice from data from fax), information about the call-source ('Overseas' or 'Operator Connected'), reasons why the CLID isn't being provided ('Private' or 'Out of Area') and text information about other services ('Message Held in Voice Mail Box').

Note the inclusion of a field for 'data-type,' which has the potential to allow fax and data-modems to be hung on a single voice-line and provide automatic switching of the incoming call to the appropriate device. This would make fax-switches obsolete, and save many homes and small businesses from investing in a second telephone line. Do you want to bet on whether this is ever implemented in Australia?

These ADSI-format messages can be anywhere between 3 and 258 bytes, and in ASCII or binary form. But since the messages are delivered before the call connection is completed (and before billing starts) you can assume that the telephone companies will keep tight control over what messages and field-types are deliverable in this way.

These display devices have enough memory to record a number of incoming CLIDs, and they do this even when the phone isn't being answered, or if it is answered by a local voice-mail system or answering machine. You can retrieve numbers for the last few dozen calls from a stack, and if you can select a number the box will dial this number for you.

However, the hackers in America have already come up with a new add-in 'blue-box' called 'Presto Chango' which modifies the CLID number at the source — and this clearly has mischievous implications. Not only can you send CLIDs now, you can also send false identification. It will be interesting to see how the phone companies react.

And because some internal corporate voice-mail systems now use CLID as a means of authentication to allow company executives access to company-account long-distance calls (Caller Forwarding), the hackers are having a great-time modifying their CLID and fooling the voice-mail system into accepting them as legitimate users. They can't do this will all voice-mail systems, but they can with some.

Many Objections

From the viewpoint of the authorities, many of these new network CLASS features are obviously valuable. With CLID, police can now trace threatening phone calls easily, and since they are buffered, they can trace them well after the event. And they can identify the specific location of a suspect who calls a police station: bomb threats are an obvious example here. In the States you can't block CLID delivery to police or emergency services.

US fire brigades say that CLID has curbed false alarms, and both business and welfare institutions are using it to verify phony orders and false information. Stockbrokers can now flash-up the portfolio of a customer before they pick up the phone, thus improving their customer service. And telemarketing firms can have your name and address available on the screen before they take an order by linking CLID to a reverse directory.

But many of the larger telemarketers are also connected on-line to credit bureaus, so the incoming CLID can also trigger the display of more personal details such as your insurance coverage or credit history. And people calling to inquire from a store about a product find that they are later harassed by constant telephone sales pitches — or suffer because automatically-generated telemarketing lists with their name included have been made available for a fee to other retailers or mail-order firms.

The ADSI Extension

Analogue Display Services Interface (ADSI) is a new protocol from Bellcore which extends CLID services. It provides an improved CLASS 'feature control' capability, and it opens the door to other service providers who would otherwise be dependent on user-terminals with full screens and a keyboard. ADSI was originally developed to allow people with Call Waiting on analogue lines to know the identity of the second caller before they ask the current party to wait, so it extends the CLID delivery phase (during the ring sequence) into the conversation phase.

A DTMF 'D' digit (4C/4R on the DTMF dial) is sent to the phone, and if the phone is ADSI-equipped it responds with a 'D' digit and opens a ASCII CLID transmission path to the handset. After delivery, the normal transmission path is then reconnected. The user hears some clicks as the CLID data is downloaded into the LCD box.

There are other uses of this system since the same process can be DTMF-controlled end-to-end across a network rather than just from the local exchange. Northern Telecom is running an ADSI trial in Boston for a bank-at-home-application which causes the POTS line to alternate between voice and data. However the system seems to be intolerant to interruptions, so Call Waiting must be turned off.

Stewart Fist

In an attempt to curb these commercial abuses, some American States permit a special prefix (specifically *67 in the US and 141 in the United Kingdom) to be added by the A-party before the number is dialled. This command-code is then carried through the network to the last exchange where it is interpreted as an instruction to block the delivery of the CLID when placing the call.

This denies the receiver the right to see who is calling before picking up the handset, so in some States the B-party can also dial a *77 toggle, and then all calls *not* accompanied by a CLID will be blocked at the exchange. The last exchange delivers a voice-reply back to the caller saying 'This number does not accept anonymous calls.' This is Anonymous Call Rejection (ACR) and it both adds service, and creates problems in its own right.

CLID delivery can also be blocked automatically for all calls by the A-party's exchange. Under Public Utility Commission regulations in California, these blocking procedures must be offered free of charge, while in other States the telephone companies are free to impose a reasonable charge for *not* delivering this data. Bell Canada has been billing customers 85 cents a call to block the delivery of CLID, but it has since removed this charge.

Illinois recently took the step of mandating that CLID would be blocked on all calls unless the delivery of the number was specifically requested by the customer. On the other hand, some States like New Jersey, until recently, would not permit the CLID to be blocked either on an individual call basis, or as a whole — except for unlisted numbers. In other parts of America, the fragmented local, regional and inter-exchange network will not carry CLID at all, anyway. To have true CLID, both the A- and B-party's exchanges need to be equipped to handle it, and all intermediate stages must be using CCS#7 signalling — but there are ways of getting around this.

There are many occasions where people don't want their number delivered, and the privacy advocates make the valid point that people will often forget to prefix the *67 blocking code. After all, Optus boss, Bob Mansfield, publicly admitted that his family often forgot to dial the 1 prefix to select Optus for long-distance calling in the trial days before the ballot! And, if remembering to add a prefix was easy, then we wouldn't have needed the ballot.

This automatic delivery of CLID is not just a problem for people who wish to avoid junk-mail or the unauthorised recording of their number by telemarketers. People seeking psychological assistance may not be willing to phone a crisis-line if they can't be guaranteed that they will retain their anonymity, for instance. In cases of family break-up, the children of an estranged wife may phone home and automatically reveal the new 'confidential' phone number unwittingly to the father.

And, since psychiatrists and social workers routinely contact mentally disturbed patients from their home phones in off-duty times, they are now worried that these calls will place their families under threat — either physical threat, or from constant interruptions. Neighbours, also, may not report child abuse so readily if they know that they can be automatically recorded as the complainant, and whistle-blowers giving confidential information to the police or to a newspaper may not wish to leave an identifiable trail.

Most intelligent people wouldn't trust an electronic blocking system outside their control — and their fears are justified!

However, information-delivery works both ways. In one case documented on the Internet, a heavy breather got his just deserts when he made a nuisance call late at night, and forgot to block his CLID. The woman he called had great delight in distributing the telephone number among activists at a female-empowerment meeting, and the support-group scheduled all-night nuisance calls for the next few months and harassed the guy with automatic dialling machines. But, of course, the person who received these calls may well have been the customer who paid the line rental, not the idiot who started the ball rolling. I predict that the lawyers are going to have a field-day on this one!

The American black community also has raised legitimate questions about how telemarketers will interpret the exchange prefix of CLID numbers. The National Association for the Advancement of Colored People (NAACP) is concerned that the service could lead to discriminatory redialling and answering — the retail outlets will ignore or divert calls from depressed districts, or quote higher prices to cover extra risks involved in dealing with mail-order customers from certain geographical regions.

And what happens to people with unlisted numbers, for instance, in those States which demand the CLID delivery? New Jersey has recently had to modify its regulations to take this into account, and it now offers CLID blocking and ACR. The obvious solution is for unlisted customers to block CLID delivery on a permanent basis! It may be obvious, but it isn't always valid.

ACR is now being offered by BellSouth and a number of other companies for a small

Hey Presto!

A 'Presto Chango' box blanks out the Caller Line ID information by substituting *any* desired information on the receiver's display in the number, time, date, and name display elements.

Presto Chango works by transmitting data information end-to-end in the same format as Delux CLID (a sub-set of ADSI), and since the latest burst of information is always stored in the top of the buffer and displayed on the LCD screen, incorrect or misleading information can be provided at will. However, the device only changes the CLID display after the call has been answered — so it doesn't prevent automatic screening at the exchange. The new information is carried in-band over the voice circuit, and so an alert B-party may notice the modem tones while this is being done. But a dual-tone is used to mask the data transmission.

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Cellular CLID

In the United States, Bell Atlantic Mobile has announced a trial of Spoken Caller Identification, Selective Call Delivery and Who's Calling Me? services for its AMPS cellular subscribers.

- *Spoken Caller Identification* uses a voice announcement of the name and/or number of a caller using digital voice technology, before the call is answered.
- *Selective Call Delivery* allows you to pre-program a list of call numbers into the phone so that they will be automatically rejected.
- *Who's Calling Me?* gives customers a spoken list of unanswered names or numbers, which can be return-called by touching one button.

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monthly fee. This is a B-party CLID service, where your local exchange will block all calls of a certain class.

The main class it suppresses are calls which are accompanied by the *67 'Block CLID delivery' code. These calls won't ring your phone or offer call-waiting tones if you are on another call. If you also have Call Forwarding on the line with the ACR active (it can be turned on or off by the customer) the calls will not be forwarded unless accompanied by a CLID.

Instead, the A-party gets a prerecorded message saying that you don't accept calls unless the CLID is offered — but not all exchanges, or all interconnection services can offer CLID. And since the exchange accepts these calls and replays a prerecorded message, the carrier regards them as a 'completed' call, and bills the A-party for the privilege of having the call blocked. Of course, it is also billing the B-party for providing the ACR blocking service.

One can think of some valid uses of ACR; however you wouldn't want to use ACR if your contacts were with constant travellers who used phones which may not provide CLID. Anonymous Call Rejection is primarily aimed at providing a way to screen voice-calls, but it can also be used on modem and fax lines to validate the A-party before permitting connection.

Call Blocking is a new CLASS feature which allows you to specify that incoming calls from certain numbers should not be connected. This differs from the ACR approach in that you need to enter an explicit list of numbers which are held in a database at the local exchange. It acts on the ANI (not on the CLID), so it can capture calls even where CLID-delivery has been blocked. In some systems, you can automatically add to this list the last caller's ANI by dialling a specific command code immediately after hanging up.

Call Blocking will appeal to people who need to prevent nuisance calls from a known number (or list of numbers), but it can't stop the caller from using a telephone box.

Call Trace (as an automatic measure supplied by the carrier) is another new feature being offered by some of the American telephone companies as an alternative to Caller Line ID for tracking nuisance calls. The telephone company automatically records source and time details of all incoming calls on a long term basis (held for 30 days), and these can then be made available to the police or to the person called.

This feature is closely aligned to Last Number Redial and Auto Callback which are also being widely offered, often in association with Call Waiting. If you chose not to take a second incoming call, or you don't reach the phone before the phone stops ringing, you can dial a star-command code, and the last ANI in the exchange records will automatically be redialled — but you won't be shown the number. Auto Callback redials when you disconnect from the previous call, and in some implementations it will keep redialling if the line is engaged until it gets through. This is already being used as a way of harassing people who don't wish to take a call.

Call Trace and the Last Number Redial systems together satisfy most of the privacy and value-added features of Caller ID without the negative implications. Customers have a way of tracing nuisance calls (at about $4 per trace) and easy access to the number of the last person who called — but without breaching the A-party's rights of privacy (or at least, not on a regular basis because of the costs involved).

Telephone call rejection can also take place in the customer premises equipment (CPE). There's a Colonial Data Technologies-supplied 'Block The Blocker' CLID box which, when enabled, automatically answers the call, checks for a Caller Line ID, then plays a refusal message before hanging up. The functional difference between ACR supplied by the carrier and call-rejection by CPE is, of course, that the modem/fax line is not tied up during the rejection process. You can also record your own refusal messages with this approach, but it won't screen calls if you've got Call Waiting or Call Forward.

One suggestion that was recently circulated on the Internet is that telemarketers, donation-seeking companies, and 'survey' companies should be required to use phone lines with a clearly identifiable 'class' number. Just as companies can now have a State-wide or Australia-wide Customnet-13 number, a special 'area code' (say 300 or 400) should be set aside in the new numbering plan specifically for companies and organisations who make unrequested calls. Either the ACD service at the exchange, or screening equipment on the customer's premises, could then be programmed to reject calls with this class prefix.

In America, the rights of telemarketers are rigidly protected by the First Amendment (freedom of speech) so this approach both satisfies the rights of the caller, and the rights of those who choose to reject these calls.

Whose Rights?

It is generally accepted now that the A-party should have the right to block the delivery of Caller Line ID — most States in the US now permit blocking to be implemented. However we should recognise that the B-party has the right to check who is calling before picking up the phone, if he or she wishes, and to use call-diversion and call-answering systems which can discriminate on the basis of the caller's number. Heavy-breather or obscene calls are obvious examples where the receiver's rights are being breached if CLID is possible, but not being provided.

However, it must also be obvious that the main value of the telephone system today lies in its ubiquitous connection. Our modern society now has reasonable expectations that most people can be contacted by phone if you know the number — and that they can be contacted without needing special equipment or procedures. Are we in danger of losing some of this utility through trying to add these features?

Since many inter-exchange and international networks in the United States still don't deliver CLID, ACR systems must accept some calls not accompanied by the CLID information. The local exchange is generally set up not to prohibit 'outside area' calls while blocking 'private' (*67) calls — and this means that you can often defeat ACR blocking just by phoning from outside the CLID-delivery area, by making an 'operator connected' call, or by calling through an intermediate system.

Within the US network, billing information is exchanged by universal transmission of ANI (Automatic Number Identification) which is very similar to basic CLID except that it is related to the billing system, rather than the line location. And if you dial some specially-tariffed 800 numbers, the network automatically delivers to the customer (the owner of the 800 service) a conversion of the ANI — even where true CLID is not available.

This transfer of the ANI across the network for billing purposes must be much the same in Australia, but Telecom doesn't want to talk about this. Telecom needs to

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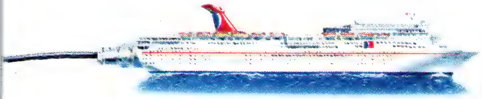

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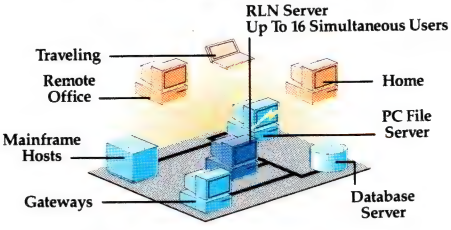

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transfer billing information to Optus for long-distance or 008 Freecalls, but unfortunately I haven't been able to get a straight answer as to how the local ANI system works in Australia or whether it is delivered to 008 Freecall customers.

Note that the ANI billing number is not necessarily the same as the number that originated the call — while the Caller Line ID is. Calls can be forwarded through other intermediate systems, and so the ANI delivered will be that of the last 'billed number' in the chain.

Note that there is also an ANI-based service available called 'Call Blocking Unblocking' which Optus shareholder Cable & Wireless and some other long-distance carriers are making available in the States to their 800 customers as a special service. This supposedly provides the CLID information (not just the ANI billing number) to customers of 800 Freecall services — even when CLID blocking has been applied! In other words, it transmits the information even against the expressed wishes (and actions) of the A-party. There's some dispute about whether they are just ignoring the Call Blocking command, or whether they are translating the Automatic Number Identification information into the CLID format at the last exchange.

You could argue that if people choose to use a reverse-charging Freecall system, then the company that pays the bill has the right to know the Caller's ID. But does that extend to situations when Call Blocking was deliberately used? And, do these companies then have the right to include the number automatically on a re-dialling device or sell it as a telemarketing list? There are obvious clashes of interests here — and some very critical privacy issues involved.

The Commonwealth Court of Pennsylvania has recently decided, in the case of *Barauch vs the Public Utilities Commission*, that CLID delivery could violate constitutional privacy rights, however there are both concurring and dissenting opinions on this ruling. In New Jersey, the Public Utilities Commission has recently held a public hearing on the matter, and, while now permitting Caller Line ID blocking, it has imposed special study and reporting requirements on the local phone company. This is a temporary decision and the court has reserved the right to terminate the service in the future.

Bellcore has now defined an enhanced Caller Line ID system called 'User ID' or 'Delux ID' (making use of ADSI protocols) where both the name and the number of the telephone customer are delivered. And for better or worse, most advanced telephone companies around the world anticipate offering this service eventually.

The network checks its own billing records, extracts the name, and includes it in the CLID package — but note that in calls that cross between two telephone companies (e.g. Telecom to Optus), the name must be extracted from the A-party's records to be delivered to the B-party's system. I guess that eventually you may be able to dial commands to suppress the delivery of the number and/or the name, or both, so I hope they eventually produce wall-charts with all the relevant commands. You'll soon need a tertiary education to navigate these systems.

With Delux CLID, both name and number are delivered to the receiver's LCD screen, but note that this is the name of the *customer*, not necessarily of the caller. You'll likely develop a phobia about allowing wild teenage parties at home if it means ending up in the courts because of mischievous phone calls made late at night under your customer name. I've got a few diabolical friends who would elevate this to an art-form given half the chance.

Stewart Fist is a freelance journalist based in Lindfield (NSW).

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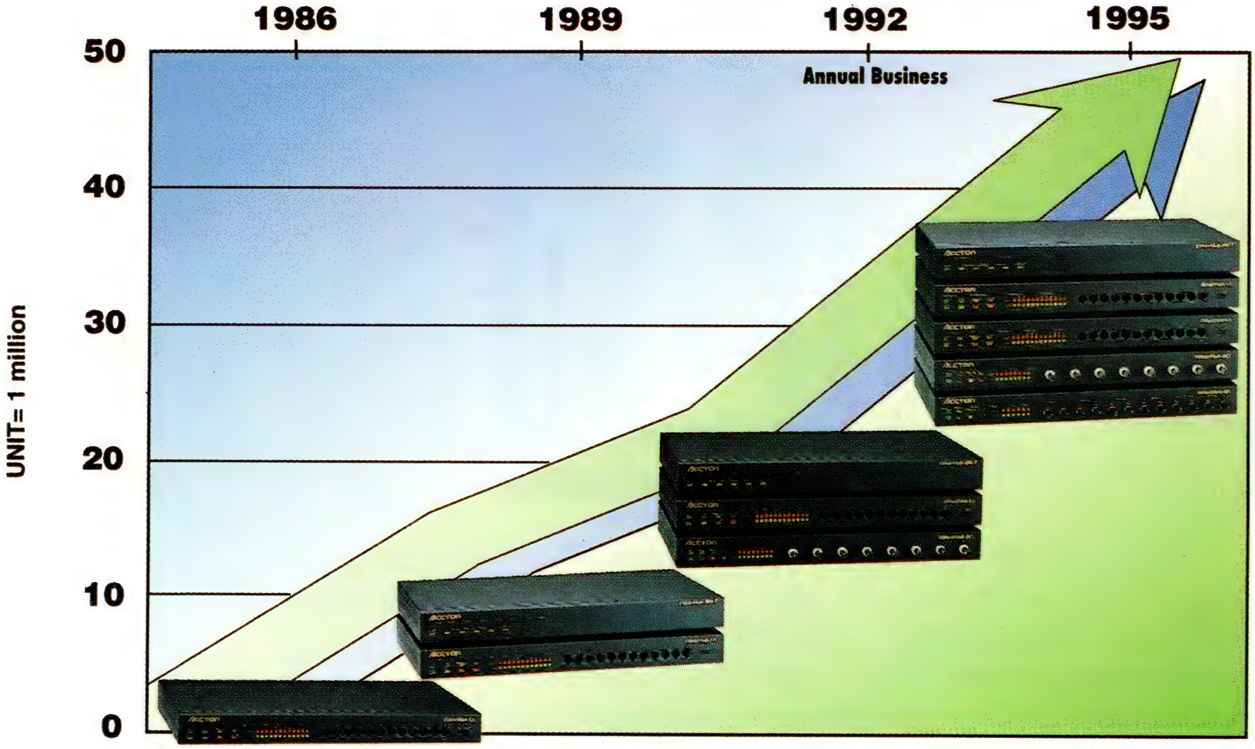

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No-Frills Ethernet Hubs: Stack 'Em and Save

For both branch offices and workgroups, the new breed of stackable Ethernet hubs can deliver the ports network managers need for a much lower cost than traditional bus-based products.

They may not offer clip-and-save discount coupons, but every now and then networking vendors do come up with a helpful way for managers to stretch their equipment budgets. One handy money saver to hit the shelves in force over the past year is the stackable Ethernet hub, which can cut the cost of connecting workgroups and remote sites by between 10-25%, and in some cases by 50%.

Stackable local area network hubs — sometimes also known simply as stackables — do the same basic tasks as conventional modular hubs, but with one big difference: instead of being slotted into a hub chassis that has a high-speed bus, stackable hubs are connected by cables and are (you guessed it) stacked on top of one another in wiring closets. Eliminating the bus enables vendors to slash the per-port price of stackables significantly.

To get the lower cost, managers have to sacrifice some features that they may take for granted with modular hubs, such as hot swapping of individual modules, the use of redundant interhub connections and power supplies, and the ability to configure local area network workgroups via software rather than rearranging cable connections. Stackables also take up more room than their chassis-based counterparts. The good news, though, is that stackable hubs can handle fairly large numbers of users. Individual hubs, also known as network modules, can be cabled together to form a single hub unit. The hardware modules have jacks that provide cabled connections to LAN devices connected in a star topology (see the figure on page 97).

The interface of choice for stackables is the RJ-45 jack for unshielded twisted-pair (UTP) workstation connections, but a number of products are equipped with connections for shielded twisted-pair (STP), coaxial, or fibre cabling. Stackable hubs also have management components to bring them under the watch of a central management console.

Hard-to-please equipment buyers apparently are taking to stackable Ethernet hubs in a big way. Stackables are the fastest growing segment of the hub market, with sales predicted to more than double in 1994. Leading hub vendors contacted for this article expect stackables, on average, to account for about 45% of their total revenue this year. Up until now, the stackable hub market has been dominated by Ethernet products. In the next twelve months, however, a number of vendors are expected to take the wraps off more Token Ring stackables as well.

The dozens of Ethernet stackable hubs now available offer a broad range of options and features. Cabling, management, and security facilities vary widely. Some stackables have flash EPROM chips, which means upgrades can be downloaded via software; others require hardware changes to bring them up to date. And while a few vendors now offer stackable bridge or router modules that outfit their products for service in remote branch offices, many have not yet gotten around to it. For these reasons, shopping for stackables must go beyond simple per-port price comparisons to include close scrutiny of hub functions.

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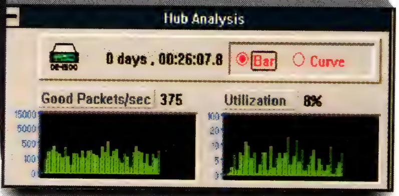

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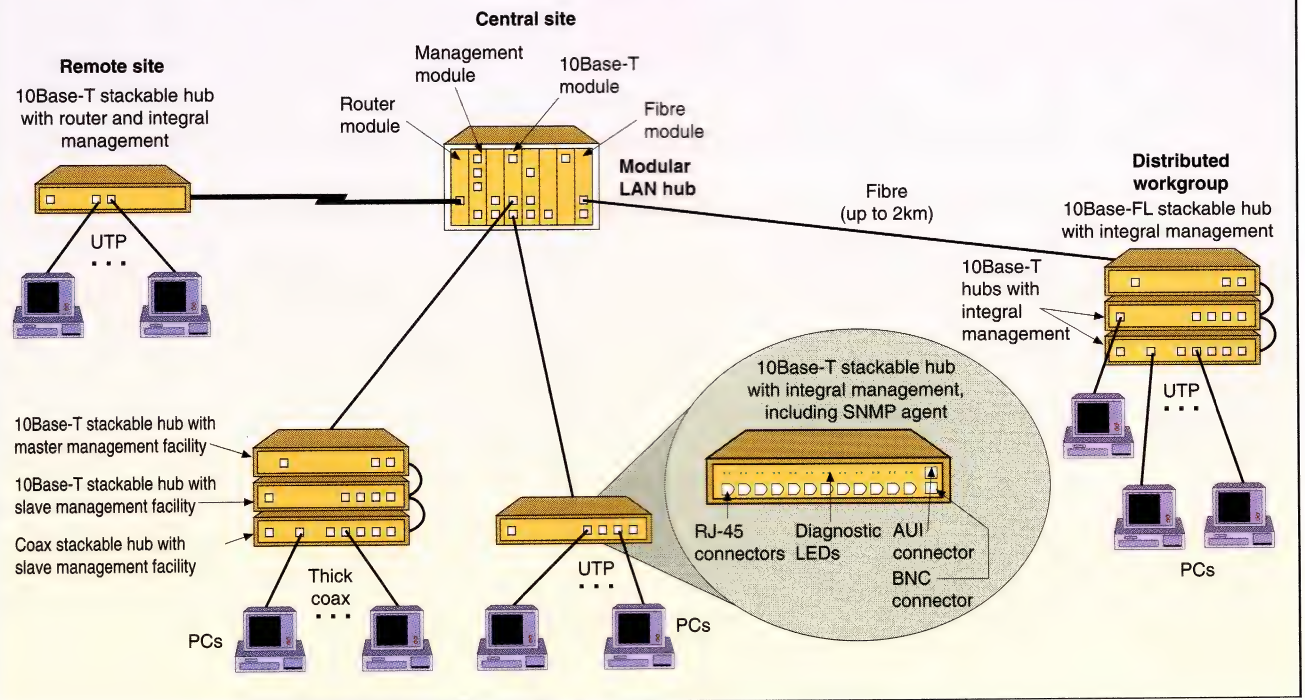
A Stackable Scenario

Net managers can use stackable hubs to provide low-cost connections for small workgroups and remote sites and then link those hubs to a modular central-site hub that manages all attached equipment. Most vendors offer stackable hubs that handle different kinds of connections (unshielded twisted pair, coaxial, or fibre), letting managers mix and match modules.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PCs
PCs

Hub Count

A large number of vendors are now shipping manageable stackable Ethernet hubs (see the table). Many also sell conventional modular hubs — including market leaders like Cabletron Systems, SynOptics Communications, 3Com and Ungermann-Bass.

Companies that sell both kinds of hub products are careful to stress that their individual product lines are complementary, rather than competitive. Modular network hubs are often recommended for solving business problems that require the network to be continuously available, flexible, and manageable.

All stackable Ethernet hub vendors sell at least one module that offers either RJ-45 or 50-pin telco jacks for 10Base-T UTP links spanning up to 100 metres. Some also sell shielded RJ-45 connectors for STP connections. Most 10Base-T modules come with 12 or 24 ports; David Systems and Hewlett-Packard offer stackables with up to 48 RJ-45 jacks.

Some vendors sell stackable modules that handle other cable types (and greater drive distances). For instance, modules with thick coaxial connections feature AUI (attachment unit interface) jacks and carry

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Stacking Up the Stackables

VENDOR	MODULE	BASE PORTS/OPTIONS	MAXIMUM MODULES/UTP PORTS PER REPEATER	MANAGEMENT FACILITIES
Accton Technology AC&E Sales (02) 712 3555	Etherhub-12I; Etherhub-MGT (management module)	12 RJ-45, 1 AUI, 1 BNC; 2 RS232, Bus-In, Bus-Out	14; 168	Up to 14 12Is managed by one Etherhub-MGT or Etherhub-12MI mgmt module
	Etherhub-12MI	12 RJ-45, 1 AUI, 1 BNC, RS232, Bus-In, Bus-Out	14; 168	Combined Etherhub-12I and Etherhub-MGT
	Etherhub-6FI	6 ST, 1 AUI, 1 BNC, Bus-In, Bus-Out	13; 156	Up to 14 modules of 12I, 6FI, 8CI hubs can be managed by one Etherhub-MGT or Etherhub-12MI
	Etherhub-8CI	8 BNC, 2 AUI, Bus-In, Bus-Out	13; 156	
Acsys (02) 299 2799	Etherstack 24CS; Etherstack ICS (management module)	24 RJ-45; 1 AUI (24CS); 12 RJ-45/ 1AUI, BNC, RJ-45 or 10Base-FL (ICS)	7; 156	Up to 6 24CSs managed by one ICS
ADC Fibermux ADC Telecommunications (02) 975 1499	SnapLAN Ethernet Hub; SnapLAN Ethernet Management Module	8 or 16 shielded RJ-45; 8 shielded RJ-45	5; 56	Combined Ethernet and TR stack can be managed by one TR mgmt module. Ethernet mgmt module manages Ethernet-only stack. Flash EPROM provides remote download capability
	SnapLAN Token Ring Hub; SnapLAN Token Ring Management Module	6 or 14 shielded RJ-45; 8 shielded RJ-45, 1 RI/RO MAU	4; 48	
	SnapLAN Wellfleet Router Module	1 or 2 WAN ports; 1 Ethernet and/or 1 Token Ring port	1	Managed by Wellfleet Site Manager
AT&T/NCR (02) 964 8111	StarLAN Smarthub Model B	12 RJ-45	5; 60	Integral
	StarLAN Smarthub Model FB	7 FOIRL, 1 RJ-45	Not applicable	Integral
Cabletron Systems (02) 878 5777	Hubstack SEHI-22	12 RJ-45/1AUI or 10Base-FL	5; 60	Integral
	Hubstack SEHI-24	24 RJ-45/2 AUI or 10Base-FL	5; 120	Integral
	MicroMMAC-22E	12 RJ-45/1 AUI or 10Base-FL	5; 60	Integral
	MicroMMAC-24E	24 RJ-45/2 AUI or 10Base-FL	5; 120	Integral
	BRIM-WT1/E1	1 RJ-45 (dedicated bridge module for MicroMMAC)	Not applicable	Integral
Chipcom Corp. (02) 416 0653	Onsemble Stackable Expansion Hub; Onsemble Stackable Base hub (mgmt module)	12 RJ-45, 1 AUI (Expansion Hub); 12-RJ-45, 1 AUI, 1 BNC (Base Hub)	5; 60	Up to 4 Expansion Hubs managed by one Base Hub
Cnet Technology Mitsui (02) 452 0452	CN8910TPC	12 RJ-45, 1 BNC, 1AUI	8; 96	Integral
David Systems Comperex (02) 878 5888	Expressnet Workgroup Hub Model 6362/6366; Model 6360/6364 (mgmt module)	24 RJ-45 or 50-pin telco (6362/6366); 24 RJ-45 or 50-pin telco and 1 AUI (6360/6364)	2; 48	One 6362/6366 managed by one 6360/6364 or one 6361/6365
	Expressnet Workgroup Hub Model 6363/6367; Model 6361/6365 (mgmt module)	48RJ-45 or 50-pin telco (6363/6367); 24 RJ-45 or 50-pin telco and 1 AUI (6361/6365)	2; 72	1 6363/6367 managed by 1 6361/6365
Digital Equipment Corp (02) 561 5252	DECrepeater 900TM	32 RJ-45/1 AUI, 1 BNC, 1 FOIRL, 1 RJ-45	1; 32	Integral
	DECwanrouter 90	1 BNC, 1 V.35	Not applicable	Integral
D-Link Systems Kincolith (02) 977 4466	DE1200; DE1600 (management module)	12 RJ-45 or 50-pin telco, 1 AUI, 1 BNC (DE1200 and DE1600)	5; 60	Up to 4 DE1200s managed by one DE1600
	Bub	12 RJ-45 or 50-pin telco, 1 AUI, 1 BNC, 1 EIA-232	5; 60	Integral

MANAGEMENT PLATFORM	PRICE (BASE CONFIGURATION, INC. TAX)
Windows	Etherhub-12I $1,776; Etherhub-12MI $2,449; Etherhub-6FI $3,734; Etherhub-8CI $3,173; Etherhub-MGT (management module) $1,588. Bundled with Accview management software
As above	
As above	
Windows	$3,200
Windows, HP OpenView, Sunnet Manager	16 port managed Ethernet $4,052. Wellfleet router module is priced at $6,759
As above	
Windows	$4,200
Windows	$4,200
Cabletron Spectrum 2.0, HP OpenView, Novell NMS, Sunnet Manager, Windows	$4,569
As above	$5,714
As above	$9,338
As above	$10,483
As above	$2,852
HP Openview, Sunnet Manager, IBM NetView/6000	P.O.A.
Windows	P.O.A.
Windows	$3,700/$5,600
As above	$6,100/$6,900
DEC Polycenter, VMS, Windows	$4,022
As above	$3,176
DOS, Cabletron Spectrum, HP OpenView, Novell NMS, Sunnet Manager, Windows	DE1200 $1,520; DE1600 $2,702
As above	P.O.A.

data for distances up to 500 metres. Thin coax modules have BNC connectors and carry data up to 185 metres. For fibre cabling, FOIRL (fibre optic inter-repeater link) modules handle link distances up to one kilometre, while modules based on the new 10Base-FL addendum to the FOIRL standard can drive data for up to two kilometres (see also '10Base-F Stretches Ethernets' in the December/January 1993-94 edition for a summary of the latest 10Base-F specifications approved last September by the IEEE). Product lines that handle multiple cable types give managers the flexibility to mix and match media types in the same hub stack.

Stackable modules usually also feature one or two other connectors-handling AUI, BNC, FOIRL, or 10Base-FL cabling — for use either to link to extra LAN devices or to connect to local area network backbones. With some stackables, extra connectors come built in as a standard feature. Others offer a choice of cable connectivity via optional slide-in modules. Such options can significantly increase the per-port cost of a stackable module.

While stackable products don't require a rack to work, as a matter of convenience most vendors supply mountings that allow their modules to be installed in a 19-inch rack. Stackable modules take up anywhere from 4cm to 9cm of rack height.

Repeater Rules

Every stackable hub module comes with a repeater — a device that moves packets between Ethernet local area network segments. This component provides network managers with the option of installing individual modules as standalone, autonomous hubs. With most stackable hubs, all except one of these repeaters can be disabled when multiple modules are stacked as part of the same hub. A proprietary ribbon or drop cable a few centimetres in length is usually used to combine the modules into a single logical network device, but ADC Fibermux recently broke new ground here with its SnapLAN hub modules which simply slot into each other.

The reason for taking other repeaters out of service is to minimise network delay. The IEEE 802.3 Ethernet standard specifies that no more than four repeaters can be installed between any two network nodes. At that point, users have to buy bridges and routers to segment the network, otherwise delay introduced by repeaters causes network performance to degrade to unacceptable levels. By limiting repeater counts, vendors reduce the need for users to spend money on such equipment.

The number of hub modules that can be stacked in a single-repeater design varies widely from vendor to vendor. The Magnum series from Garrett Communications allows up to 20 network modules to be stacked with one repeater. For its Expressnet products, David Systems allows only two modules to be stacked with a single repeater. The maximum number of devices that can be attached to a one-repeater stack varies according to how many ports (cable connectors) are featured on each network module.

Vendors that do not allow hub module repeaters to be disabled include Digital Equipment Corporation, Hewlett-Packard and Network Resources Corporation. With these products, modules are connected using coaxial, UTP, STP, or fibre lines. HP uses a daisy-chaining technique to limit to two the maximum number of repeater hops incurred in a stack.

Stacks or Piles?

The ability to run multiple modules using a single repeater is the source of some controversy among makers of stackable Ethernet hubs. Some vendors contend that products that can't be stacked to appear as a single logical unit shouldn't be called stackable. Conversely, vendors that don't allow single-repeater stacking counter that the one-repeater rule is bogus, and that the ability to provide hub functions without the expense of a bus-based chassis is the real test of stackability.

Hewlett-Packard casts doubt on the repeater limits imposed by the IEEE 802.3 standard. According to HP officials, the four-repeater limit is an early and simplistic guideline that is based on the timing of a worst-case network, where all segments are at their maximum length. They argue that by using shorter cables to connect hubs in the same stack, Ethernet traffic can traverse up to six repeaters without incurring excessive network delay.

Management is another differentiating factor among stackable products. All hubs listed in the accompanying table have some kind of SNMP-based management feature. Some vendors offer built-in SNMP agents in every module; these agents report information on network statistics and device status to a network management console. Others provide two kinds of modules — one without SNMP, and one with. With these products, several non-SNMP modules can be stacked with one SNMP module, setting up, in effect, a master-slave arrangement. An example of this product type is the SynOptics stackable LattisHub line, in which up to four 280X modules can be managed by a single 281X module.

Whether a stackable features integral or slave-master management is a key factor in influencing how cost-effective that device will be at any given location. As a rule of thumb, stackables with integral management are more expensive than those without. Products that incorporate integral SNMP management agents in every network module are better suited for use at small

Stacking Up the Stackables (Cont.)

VENDOR	MODULE	BASE PORTS/OPTIONS	MAXIMUM MODULES/UTP PORTS PER REPEATER	MANAGEMENT FACILITIES
Garrett Communications ADE Network Technology (03) 543 2677	Magnum Model 3024	24 RJ-45/1 AUI, BNC or 10Base-FL	20; 480	Integral
	Magnum Model 3012	12 RJ-45/1 AUI, BNC or 10Base-FL	20; 240	Integral
	Magnum Model 3000X	12 ports, individually configurable as AUI, BNC, DTE, RJ-45 or 10Base-FL	20; 240	Integral
Hewlett-Packard 13 13 47	HP Ethertwist Hub Plus	12 RJ-45 or 50-pin telco, 1 AUI, 1 BNC	1; 12	Integral
	HP Ethertwist Hub Plus/24S	24 RJ-45 or 50-pin telco, 1 AUI, 1 BNC	1; 24	Integral
	HP Ethertwist Plus/48	48 RJ-45 or 50-pin telco, 1 AUI, 1 BNC	1; 48	Integral
	Router FR	1 EIA-232 and 1 AUI or 1 BNC	Not applicable	Integral
INC (02) 645 2200	412/XC; 412/MC; 412/M	12 RJ-45, 1 AUI, 1 BNC (XC); 12 RJ-45, 1 AUI, 1 BNC DCE, DTE (MC); DCE, DTE (M)	12; 144	Up to 12 412/XC managed in one stack. Management supplied by 412/M or 412/MC
Lannet Toren (03) 242 5050	SH-E16 (managed version)	16 RJ-45, 1 AUI, 1 10Base-FL	5; 80	Integral
Network Resources Corp. Lidcam (03) 820 9077	Multigate Hub 1 MG1-12	12 50-pin telco/1 AUI, BNC, RJ-45 or 10Base-FL	1; 12	Integral
	Multigate Hub 1 MG-24	24 50-pin telco/1 or 2 AUI, BNC, RJ-45 or 10Base-FL	1; 24	Integral
	Multigate Hub 1+24	24 50-pin telco/1 or 2 AUI, BNC, RJ-45 or 10Base-FL	1; 24	Integral
	Multigate Hub 2MG2W-24	24 via 50-pin telco, three EIA-232, V.35, RS-449, or DIN-8/1 or 2 AUI, BNC, RJ-45 or 10Base-FL	1; 24	Integral
	Multigate Hub MGHF-12	12 10Base-FL	1; 12	Integral
Networth LANvision (02) 417 2711	Trisegment Series 3000 STM24; STMM24 (management module)	23 RJ-45 (STM24 and STMM 24/ 1AUI, 1BNC, 1FOIRL	5; 115	Up to 4 STM24s managed by one STMM24
Plexcom allNET Technologies (02) 417 4800	Plexstack 4012; 4012i (management module)	12 RJ-45/1 AUI, BNC, FOIRL or RJ-45 (4012 & 4012i)	15; 180	Up to 14 4012s managed by one 4012i
	Plexstack 4024; 4024i (management module)	24 RJ-45/2 AUI, BNC, FOIRL or RJ-45 (4024 & 4024i)	6; 144	Up to 5 4024s managed by one 4024i
Standard Microsystems Corporation (02) 238 2206	Elite 3812TP	12 RJ-45/2 BNC, RJ-45 or 10Base-FL	8; 96	One module with management can manage up to 7 others
SynOptics Communications (03) 853 0799	LattisHub 280X; LattisHub 281X (management module)	16 RJ-45 and 1 AUI or 1 10Base-FL (280X & 281X)	5; 80	Up to 4 280X modules managed by one 281X
3Com (02) 959 3020	LinkBuilder FMS TP	12 RJ-45, 1 AUI/1 BNC or FOIRL	4; 48	Integral
	LinkBuilder FMS Coax	10 BNC, 1 AUI/1 BNC or FOIRL	Not applicable	Integral
	LinkBuilder FMS ST/SMA Fibre	6 FOIRL	Not applicable	Integral
Ungermann-Bass (03) 693 8200	Access/Stax AH2400 U; Access/Stax AH2400 M (management module)	24 RJ-45/1 AUI, BNC or FOIRL (AH2400 U and AH 2400 M)	5; 120	Up to 4 AH2400 U modules managed by one AH2400 M

MANAGEMENT PLATFORM	PRICE (BASE CONFIGURATION)
Windows	$3,180
As above	$1,725
As above	$4,265
Windows, HP OpenView	$2,954
As above	$5,637
As above	$8,619
As above	$7,825
Windows	412/XC $1,682; 412/MC $2,904; 412/M $1,573
Castle Rock's SNM-PC; HP OpenView, Windows (1994)	$3,630
Macintosh, Windows	$4,209
As above	$5,889
As above	$8,608
As above	$11,900
As above	$12,900
Windows, Novell NMS	STM24 $3,898; STMM24 $5,852
Windows	$1,950; $3,374
As above	$3,254; $4,559
Windows; HP OpenView; Sunnet Manager; and Novell NMS mid-94	$1,805; $1,260
DOS; HP OpenView; Novell NMS; Windows	$2,160 to $2,750 (280x); $3,930 to $5,705 (281x)
Sunnet Manager; Windows; HP OpenView and IBM NetView/6000 in second half of 1994	$1,750
As above	$3,880
As above	$4,050
HP OpenView; Novell NMS; Windows	AH2400 U $4,000; AH2400 M $6,000

sites with a limited number of LAN nodes. Conversely, products that allow one master management module to manage several other devices are more economical for large installations.

All stackable products in the accompanying table provide access to management information both in-band (over the Ethernet) or out-of-band (using a dial-up connection to connect to an RS232 port on the stackable). Out-of-band access means management information is available even if the network segment crashes.

Because stackable hub management is based on SNMP, the hubs can all be managed using third party software that complies with the standard. Many hub vendors now also offer their own hub management software that runs under the Microsoft Windows operating environment.

Some vendors have also tailored their hub management software to work with integrated network management platforms like OpenView from Hewlett-Packard, NetView/6000 from IBM, and Sunnet Manager from Sunnet.

Branching Out

Vendors agree that the biggest market for stackable hubs is in branch offices with relatively small numbers of network nodes. For now, most stackable products require the use of standalone routers or bridges to make WAN connections. But several vendors now sell remote bridge or router modules that can be stacked with hub modules to connect to a central site over WAN links. As a general rule, integrated bridge or router modules tend to be less expensive than standalone products.

Cisco is now working with Israeli hub vendor Lanoptics to develop a combined stackable hub/router that incorporates the Cisco 3000 router. That product is expected to begin shipping sometime during the first quarter of this year. David Systems also says it will add a router module to its stackable line early this year, while Cabletron says it will add a bridge/router module in the second quarter.

Beating them all to the punch is ADC Fibermux, which has included a Wellfleet router module in its new SnapLAN hub line. Designed in conjunction with leading router vendor Wellfleet, ADC says the module offers a natural fit for those corporations with wide area nets based on Wellfleet routers. The company has similar deals in the works with other leading router vendors but won't say who just yet.

To allow for more efficient management of remote sites, several vendors, including Acsys, Cabletron, and SynOptics, are using SNMP's remote monitoring management information base (RMON MIB) to filter management information collected at a remote site and pass only relevant data back to the central site.

Hub Security

Most stackables also come with some form of security built in. Typically, secure stackables protect the LAN using components which can identify the media access control (MAC) address of equipment that tries to access the network; unapproved addresses are held off. Some products, such as the HP Ethertwist Hub Plus line, trigger alarms automatically to notify the central network management console when an unauthorised entry occurs. Some stackables go even further, scrambling data to every node on the network except the one for which it is addressed.

Products that do not offer security features include those from Cnet Technology, Garrett Communications, Networth and Ungermann-Bass. Another vendor that currently has no built-in security features, Plexcom, says it intends to add address identification security to its products early this year.

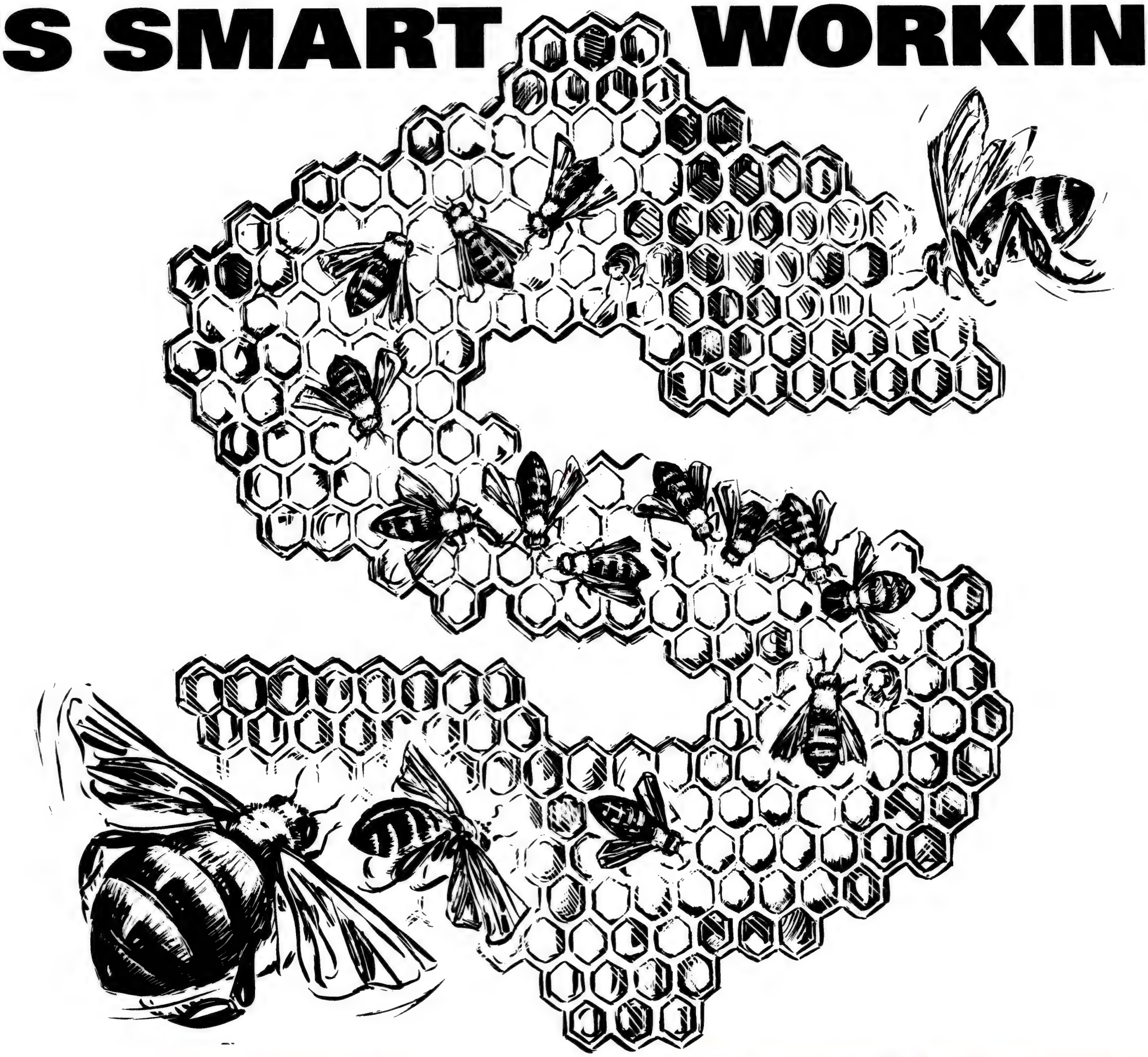
As a way to improve network performance, some stackables offer segmentation facilities that let managers isolate groups of ports to create independent 10Mbps collision domains. D-Link Systems, Lannet, Plexcom and Standard Microsystems Corporation support software segmentation on a module-by-module basis. Networth and Ungermann-Bass go further, allowing every eight ports in each of their 24-port modules to be sectioned. With products that do not offer software segmentation, the only way to divide the network is to physically disconnect network modules, or use a bridge. Cabletron, David Systems and Network Resources all sell stackable local LAN bridges that can be used for this purpose.

Although this software segmentation can undoubtedly help boost performance, stackable products cannot emulate the flexibility of modular hubs that have multiple internal buses and that allow network modules to be assigned to any of a number of LANs in software.

Almost all stackables come up short in another area where modular hubs shine — redundancy. Exceptions are Accton's Etherhub and Lannet's SH-E16, both of which emulate the hot-swappable capability of modular hubs.

Both Lannet and SMC say they have addressed the need to keep links running between different hubs by including a feature that lets users run a secondary cable between different devices in case of an outage on the primary connection. Both D-Link and SMC also allow users to configure a stackable for redundant management, so that if one SNMP agent fails, another will kick in automatically.

Stephen Saunders is Local Area Networks Editor for Data Communications magazine. He is based in San Mateo, California.



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PCMCIA Ethernet Card

Anabelle Bits has announced the Australian release of what the company claims is the fastest PCMCIA Ethernet adaptor available — the imaginatively named Ethernet PCMCIA Card from US-based Accton.

A credit card-sized Ethernet adaptor which conforms to the IEEE 802.3, PCMCIA release 2.1 and JEIDA 4.1 standards, the new product is ideal for notebook-style products with PCMCIA compliant (Type II) slots, according to company officials. It is available in two models: the EN2212-1, which is priced at $375 and supports 10Base-T; and the EN2212-2 Etherduo, which is priced at $395 and supports 10Base-T and 10Base-2 cabling. The Etherduo automatically detects and switches between the two types of cabling, the officials say.

For Novell NetWare applications, the cards feature Accton's MPX (MultiPacket Accelerator) technology, which company officials say is a collection of performance tuning hardware and software algorithms.

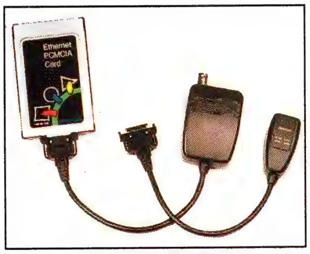
Anabelle Bits (02) 313 6155

LattisCell Gets WAN Capabilities

SynOptics Communications has announced that it has introduced a range of new interfaces and SBus adaptor cards for its LattisCell ATM switch, which the company says will provide users with a standardised method of incorporating ATM across local and wide area networks.

The new products make use of existing WAN transmission services as well as emerging services such as SDH.

Five new interfaces will be offered, comprising: the Model 10114 with 16 ports and multimode fibre SONET/SDH interfaces, priced at $70,810; the Model 10114-SM with 14 ports with multi-mode fibre SONET/SDH interfaces and two ports with single mode SONET/SDH interfaces; the Model 10114-DS3 with 14 multi-mode fibre SONET/SDH interfaces and two ports with coax DS3 interfaces; the Model 10115 with 12 ports of Category 5 UTP SONET/SDH interfaces and four ports of multi-mode fibre SONET/SDH interfaces; and the Model 10124-S with 12 ports with multi-mode fibre and 100-Mbps interfaces and four ports of multi-mode fibre SONET/SDH interfaces.



The diminutive PCMCIA adaptor is ideal for users of notebooks

The new SynOptics SONET/SDH 155.52Mbps ATM SBus Adaptor card will occupy a single SBus slot in SPARC 2 and 10 workstations, and will support the SONET UNI 155Mbps physical layers.

SynOptics Communications (03) 853 0799

New 3Com Remote Office Routers

Leading data networking vendor 3Com has recently announced a new product family called NETBuilder Remote Office. Two products have initially been released, the NETBuilder Remote Office 200, and the NETBuilder Remote Office 201.

The Remote Office 200 provides a full-featured and remote Ethernet bridge with integrated 10Base-T and WAN connectors, and is priced at $2,900. The Remote Office 201 provides economical Ethernet deployment of the Boundary Routing system, with PPP and frame relay support, and is priced at $3,225.

The product range will eventually encompass both Ethernet and Token Ring, and models will also offer ISDN BRI system support. The products will link seamlessly into 3Com's Transcend network management application, said officials.

They added that, whether used as conventional routers or using the Boundary Routing system, the NETBuilder Remote Office family offers disaster recovery, bandwidth-on-demand and dial-on-demand capabilities, and easy installation. Each unit has 24 LEDs to simplify troubleshooting, and also comes with in-built, dual-image Flash Memory which allows users to write new software versions to a test area separate from the location where the production software operates. The new product range also offers a wide

The V.F 28.8 modem can achieve async throughput of 128Kbps

General DataComm Jumps the V.fast Gun

General DataComm (GDC) has joined the list of modem vendors now rushing to bring V.fast technology to market by releasing its new V.F 28.8 Series ahead of the scheduled ratification of the new high-speed modem standard in June this year.

Touted as being ideal for infrequent but bandwidth intensive applications such as remote LAN access, LAN-to-LAN connectivity, and large file transfers, the new V.F 28.8 Series can achieve an effective throughput of up to 128Kbps in asynchronous applications. According to Australian GDC Managing Director, Brian Brearton, this means that "any organisation using an asynchronous application can enjoy ISDN speed while paying standard PSTN tariffs."

Priced at $3,000 (excluding tax), the V.F 28.8 Series boasts a mean time between failure of 177,000 hours and supports the V.25*bis* serial dialling standard, automatic dial restoration on PSTN lines, automatic switching between modem standards, password security, and remote configuration of modems from a central site. Other features include support for MNP 2-5, 2 and 4-wire leased lines, the AT command set and (optionally) V.35. In addition, future enhancements will include an SNMP-based management capability via the company's Dial Management System (DMS), synchronous data compression, facsimile (using V.17), callback security, and front panel security.

V.fast, or V.34 as it will eventually be known, is designed to deliver data transfer speeds of up to 28.8Kbps over PSTN dial-up lines. It achieves this by probing line conditions before transmission, determining available bandwidth up to 3400Hz (compared to the fixed 2400Hz bandwidth used by V.32 modems) and determining the location of the central carrier frequency. The technology also features advanced two-dimensional trellis coding and advanced echo cancellation.

GDC officials say that extensive built-in flash memory capacity makes the V.F 28.8 Series easily upgradable. So, when V.fast is ratified, upgrading to the standard will be accomplished by a software download over PSTN lines. "Organisations buying the V.fast 28.8 today can be confident that it will be compatible with the V.34 standard," according to Brian Brearton.

General DataComm (02) 956 5099

Novell's Personal NetWare replaces NetWare Lite

The Z-Stor can provide from 400MB to 1GB of storage

Zenith, Novell Launch First Personal Server

Zenith Data Systems has released what officials say is the world's first turnkey personal server, known as the Z-Stor. The product is the result of an alliance between Zenith and Novell, and will run Novell's newly-announced Personal NetWare. Personal NetWare is a major upgrade to, and re-badging of, Novell's NetWare Lite 1.1, and provides a peer-to-peer environment with a single network view which lets any user on the network see and access any resource on the network, without the need to know on which systems that resource resides.

Zenith officials said the new Z-Stor is a true plug-and-play device, and comes with Novell DOS 7, Personal NetWare and remote communications software pre-installed. The system is designed to support small workgroups, from 1-20 users, and is easily managed by ordinary users without the need for a Certified NetWare Engineer, making it especially suitable for remote branch offices. The addition of an optional 14.4Kbps PCMCIA modem card allows users to log onto the the Z-Stor remotely, and notebook PCs can be connected directly to the Z-Stor's parallel port without the need for users to purchase a special docking station.

The system automatically reconfigures itself whenever hardware or software is updated, and provides seamless integration into NetWare 2.X, 3.X and 4.X networks, with full SNMP management support. The system also features a network watch program which is able to determine network status, and will automatically shut down the server, reboot and re-establish all previous connections if a malfunction is detected.

The Z-Store comes with a range of expansion options including SCSI, CD-ROM and floppy drives and QIC or DAT tape backup units, and also provides built-in Ethernet and optional Token Ring connectors. The Model 400, which offers 400MB of storage, sells for $2,497 including tax, and the Model 1000, with 1GB of storage, is priced at $3,789 including tax.

Z-Express (02) 417 1522

selection of WAN services including frame relay, ISDN, PPP, SW-56 and X.25. Protocol support will include IP, AppleTalk, DECnet, IPX, OSI, VINES IP and XNS.

3Com (02) 959 3020

Remote PC Solution

Cray Communications has announced the launch of its RemotePC product in Australia and New Zealand. The product is an advanced solution for network users who need to access a LAN using PCs located away from their main network.

The RemotePC Server lets up to 24 remote users simultaneously establish access to services at the same level as users connected directly to the network, according to officials.

In addition, the product can be implemented in any Ethernet LAN environment, regardless of the network operating system or transport protocols used.

RemotePC can fit into any existing network environment, and, with the use of a RISC-based server with 6, 12, 18 or 24 wide area interfaces, remote PC users of any kind can access the corporate LAN or other networks connected to that LAN via routers.

RemotePC Server works as a bridge on the LAN, providing intelligent filtering techniques and extensive security features such as call-back to pre-defined numbers, user names with password protection, time limitation options for users' groups and filtering of LAN addresses.

Officials said RemotePC can also be used for low-cost backup of WAN links, and can support ISDN in some countries.

Traffic accounting features such as time and access logs can be imported into any spreadsheet, and the RemotePC Server is manageable using the Cray ScaNet Network Management Centre or through an ordinary Telnet session.

Cray's RemotePC is priced at $8,000 (ex tax) for six ports.

Cray Communications (02) 451 6655

First Token Ring Switching Hub

Standard Microsystems Corporation (SMC) claims to be the first vendor to offer a Token Ring switching solution with the introduction of a four-port Token Ring module for its ES/1 Elite Switching Hub.

The company said the advantages of the new module were that Token Ring users could dramatically improve network performance without the need to change any existing hardware, and that the architecture of the ES/1 would allow for seamless integration with ATM and forthcoming 100Mbps network technologies.

The module has four individual 4/16Mbps Token Ring ports which can be placed in one or all five of the ES/1 slots, providing up to 20 dedicated 16-Mbps links to servers, clients or populated LAN segments. Officials said the product includes features which made it especially well-suited to enterprise applications, including fault tolerance; the ability to build 'firewalls' using sophisticated filtering capabilities; and the ability to seamlessly integrate Ethernet, Token Ring and FDDI throughout an enterprise.

The ES/1 Elite Switching Hub provides full SNMP-based management, and the module supports Source Routing, Transparent Spanning Tree and also SRT Bridging methods.

It comes with both UTP and STP interfaces, and supports all of the features of the host ES/1 including temperature sensing, hot-swappable modules and duplicated power supplies.

SMC (02) 238 2206

High Speed Protocol Analysers

Adacel Communications has introduced Telenex's new Interview 8000 series family of 2-Mbps protocol analysers. The family features a range of test capabilities including monitoring, emulation, and trace-statistic modes.

Current application software for the equipment can support a

RemotePC lets up to 24 remote users to connect to the corporate LAN wide range of protocols including: Async/Bisync; HDLC/SDLC; X.25; frame relay; SMDS; ISDN; X.400; signalling system no. 7; OSI (Layers 1 to 7); and GSM cellular mobile.

Additionally, the equipment is fully programmable and has a built-in 'C' compiler, which will allow designers and engineers to handle new complex multi-layered protocols at speeds of over 2.048Mbps, said officials. The equipment is fully expandable and upgradable, and comes with plug-in test interfaces for RS-232, RS-449, V.35, X.21, ISDN (S, T, U) and G.703 standards.

Officials said the Interview 8000 series can be used for a wide range of network analysis and testing requirements, and is especially suited to solving complex protocol problems, proving hardware and software designs and verification of product and network conformance.

Adacel Communications
(03) 596 2991

PCMCIA Data/Fax Modems

Communications specialist supplier PCMCIA Technology Australia has announced a range of RediCard PCMCIA Fax Modems from US vendor Data Race.

The new high-speed V.32*bis* 14.4Kbps PCMCIA RediCard is able to accept binary, serial and asynchronous data and supports data transfer rates from 300bps to 57,600bps. The product offers Auto Dial and Answer, error detection and correction and full data compression. It also comes with Data Race's FlashLoader Flash ROM for easy upgrading.

It incorporates a fall forward/fall back capability that automatically slows the transmission speed on bad lines, and speeds transmission if that line improves. It also has its own diagnostic tests — local analogue loopback and remote digital loopback, with and without self test. The RediCard comes with an Austel-approved Line Access Module, and the card's fax complies with the CCITT Group 3 standard. It can be used in any PCMCIA Type 2.0 compatible notebook or palmtop, and prices start at $876, ex tax.

PCMCIA Technology Australia (02) 954 3411

Faster NetComm Modems

NetComm has announced new V.fast Class capable additions to its SmartModem and AutoModem ranges that can transfer data at speeds of up to 28.8Kbps.

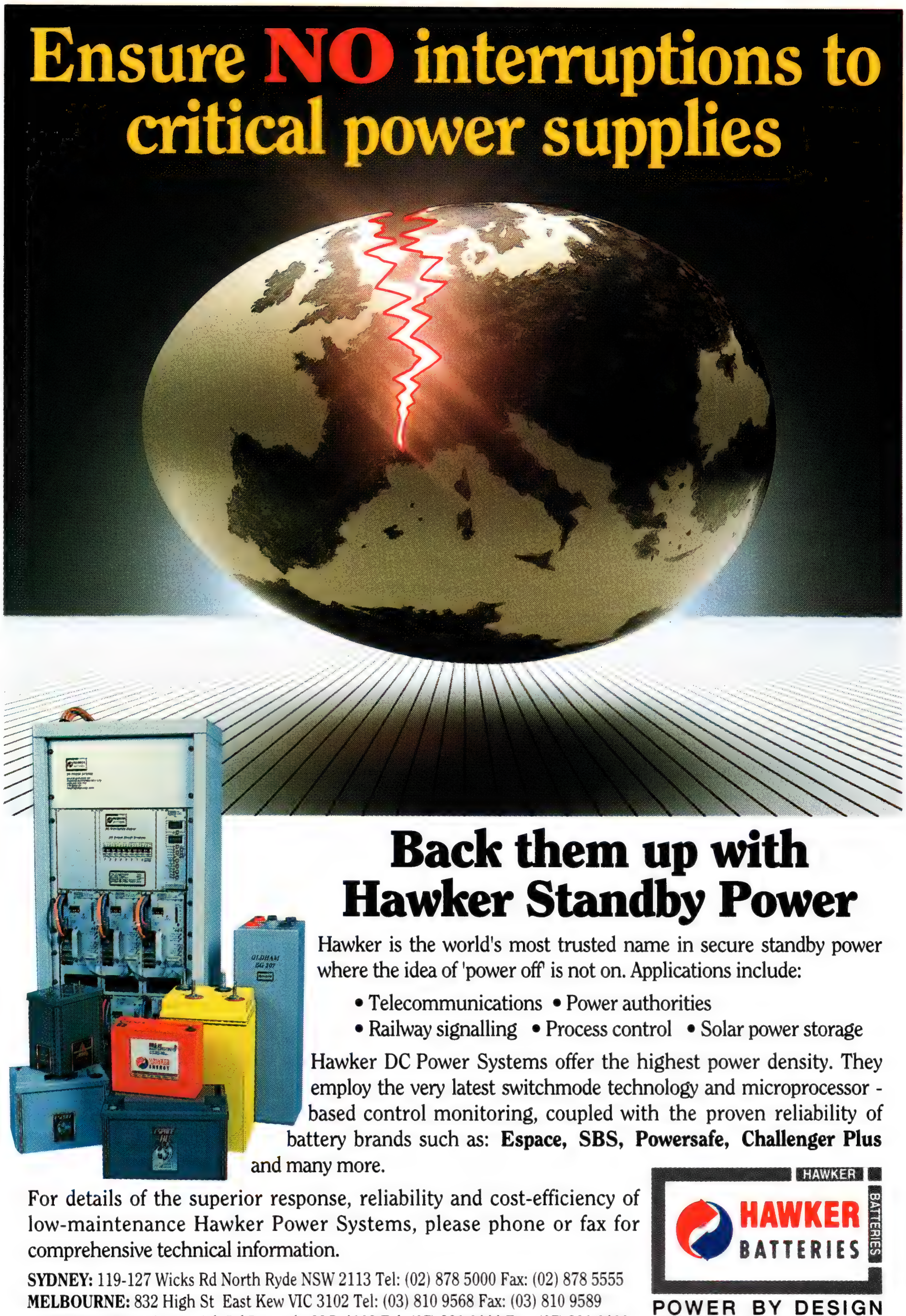
The company has revealed details of three new models in its SmartModem range. The new SmartModem M11F can support speeds of up to 28.8Kbps, while the SmartModem M10F will support speeds of 24Kbps and the M9F speeds of up to 19.2Kbps. Pricing for the new products will range from $1,299 to $1,499.

The NetComm AutoModem product family will also receive two new product additions. The AutoModem E11F will be capable of supporting speeds of up to 28.8Kbps, and will be priced at $1,299, while the AutoModem E9F will support speeds of up to 19.2Kbps and will sell for $1,099.

The new V.fast Class capable products will continue to support older data transmission standards like V.21, V.23, V.22 (V.22*bis*), V.32 (V.32*bis*), and Bell 103 and 212A.

NetComm officials said the addition of MNP 2-4, MNP 5, MNP 10, V.24 and V.42*bis* mean

The Redicard fax/modem supports data transfer at 57,600bps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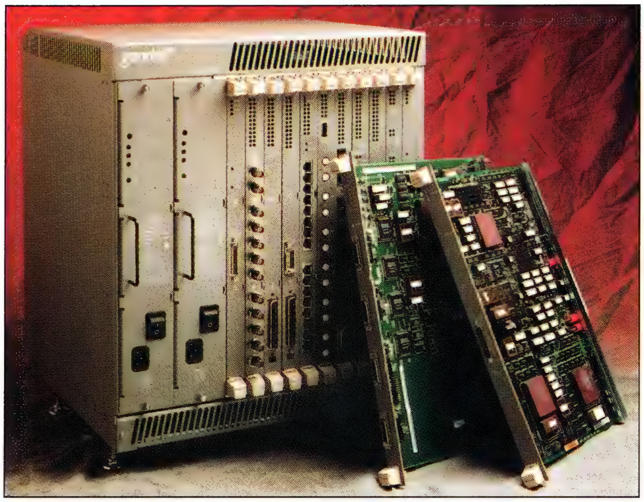


Gandalf's Prism 8000 is well suited to collapsed backbone situations

the new modems are able to achieve speeds of as high as 115,200bps, even on noisy or impaired lines.

Both the new SmartModem and AutoModem products support all major fax standards such as V.27*ter*, V.29 and V.17, and offer transmission speeds of up to 14,400bps, and can also send to or receive from any Group III fax. The SmartModem products also include DES Encryption as an option, as well as the ability to configure the modem from a remote site.

NetComm (02) 888 5533

Multi-port LAN Switching

Gandalf has recently launched Prism 8000, a new high-performance sub-system for the Access 48 and 132 internetworking platforms.

Officials from the company said the system is particularly well-suited to collapsed backbone applications, where it serves as a router-concentrator to minimise the need for stand-alone routers. Prism 8000 is able to bridge data at rates up to 800 megabits per second, and can provide user-transparent connectivity between multiple independent Ethernet and FDDI local area networks, officials said. The system can also be used to segment saturated LAN backbones into multiple switched segments via star topology wiring, which provides users with instant performance improvements, they said.

The Prism 8000 integrates the functions of a translation bridge, router and network concentrator into a single modular system, and can be installed into any existing Gandalf Access Hub. It allows users to take advantage of Gandalf's Tri-bus architecture, which is able to support up to three separate backplanes — high speed (800Mbps), standard Ethernet (10Mbps) and Token Ring (16Mbps) — on a single platform.

Features of the new Prism sub-system include a high level of security, sophisticated traffic management, transparent bridging, IP fragmentation, and multicast storm protection. It also allows communications between devices on dissimilar networks and carries out real-time 'what if' analysis of network traffic flows.

It has its own on-board SNMP agent for in-band management by any SNMP standard management system. Management features include statistics collection for each LAN or end-user MAC address, and the unit includes an integral RS-232C port which can be used for remote unit access or for out-of-band access if required.

CTEC (02) 975 4722

The Garrett Magnum 3000 series can mix network concentrator units and hubs in the same stack

Stackable Combo

ADE Network Technology has introduced a family of stackable units which the company claims is the first to enable both mixed media concentrators and 10-Base-T hubs to operate in the same stack.

The Garrett Magnum 3000 series allows a stack of up to 500 ports to be configured as a single repeater in an Ethernet network, and the design allows the linking of up to 20 10Base-T hubs, up to 10 mixed media concentrators, or combinations of the two. Additionally, the 3000 series offers an optional SNMP agent that can be shared by an entire stack.

The Magnum 3000 series is available in three different configurations: the 3024 model provides 24 10Base-T ports and one backbone port; the model 3012 provides 12 10Base-T ports and one backbone port; and the model 3000X provides 12 mixed media ports and one backbone port.

ADE officials said one of the benefits of the Garrett system is its ability to smoothly mix concentrator units with stacked hubs. SNMP is optional for each product in the Magnum 3000 Series. An SNMP agent is available on an embedded board or as a software-only agent for installation on a dedicated PC.

The Magnum 3000 Series employs a modular port construction that allows users to install the network medium of their choice on a port-by-port basis in the Model 3000X and in the backbone port of the Models 3024 and 3012. Repeater Port Modules provide users with complete repeater functionality, including the automatic partitioning of a network segment in the event of excessive collisions and reactivation of the partitioned segment when acceptable transmission quality resumes.

Other features include collision detection, jam generation and signal quality maintenance. Six different RPMs are available, including: AUI, BNC, RJ-45, Fibre-ST, Fibre-SMA and DTE, and both STP and UTP Ethernet are supported, while all fibre ports comply with the new 10Base-FL standard.

Each Magnum 3000 product can be rack-mounted or stacked, and all products feature slimline construction to minimise the consumption of vertical space.

ADE Network Technology (03) 543 2677

Protocol Analysis Add-on

Triticom has announced the release of DecodesPlus 1.0, which the company claims is the first product to enhance the protocol analysis capabilities of Novell's distributed analysis product, NetWare Management System with NetWare LANalyser Agent, and protocol analyser, LANalyser for Windows.

By the addition of support for protocols like VINES, DECnet Phase IV and NetBIOS/SMB, the DecodesPlus product allows the Novell products to cover virtually all major LAN operating systems.

New decodes available include VINES (ARP, IP, RTP, SPP, IPC, ICP, RPC, SMB, Mail), DECnet Phase IV (DRP, NSP, SCP, SMB), DEC LAT, and Microsoft/IBM NetBIOS/NetBEUI and Server Message Block protocols.

Officials said the combination of these expanded analysis suites with the NetWare, TCP/IP and AppleTalk suites already present in the Novell products creates a single Windows-based application which decodes protocols in NetWare, LAN Manager, LAN Server, Unix, Apple, VMS, VINES, Windows for Workgroups and OS/2.

DecodesPlus is available in two different versions: one for Novell NMS Console and one for Novell LANalyser for Windows. The NMS version requires Novell's NetWare Management System 2.0, and the LANalyser version requires Novell's LANalyser for Windows 2.0.

Force Technology
(02) 971 1000

New Optivity Release

SynOptics Communications has announced a major new release of its Optivity for NMS network management system. SynOptics officials said the new release offers users powerful management capabilities, which were previously only available on Unix platforms, in the NetWare environment. They said the new version is tightly integrated with Novell's NMS 2.0 platform.

Significant new capabilities of Optivity 2.0 include AutoTopology and NodalViews, and a new graphical user interface.

The AutoTopology feature provides users with real-time, automatic discovery of hubs, end devices, bridges, and switches, as well as multiple views depicting the physical and logical relationships of the elements within the network. The system-wide view of the network provides network managers with an up-to-date view of all network changes, assisting with troubleshooting and facilitating moves and changes.

NodalViews provides the ability to analyse Token Ring and Ethernet networks by displaying graphically all end-stations on the network, their status and their physical connection to the hub. The facility lets users analyse information such as overall performance, diagnostics and error conditions, and can display the resulting information in both numerical and graphical form. Users can then easily and rapidly identify heavy traffic areas and other network problems.

Optivity 2.0 for NMS is priced at $6,890, or sold bundled with NMS 2.0 for $9,840. An upgrade program will also be available for current users of Optivity for NMS

SynOptics Communications
(03) 853 0799

Microsoft Mail Upgrade

Microsoft has announced the release of version 3.2 of the Microsoft Mail Connection Gateway, a software package which lets PC and Macintosh users of Microsoft Mail communicate and share information.

Officials said the upgrade offers several new features, such as automated directory synchronisation of address lists, full Microsoft Schedule+ meeting request translation across the gateway, and better network administration.

Fully automated directory synchronisation means that the global address list of user names is always up-to-date and error-free, and the new version also reduces administration time by letting users of Microsoft AppleTalk utilise Microsoft Mail for PC network gateways.

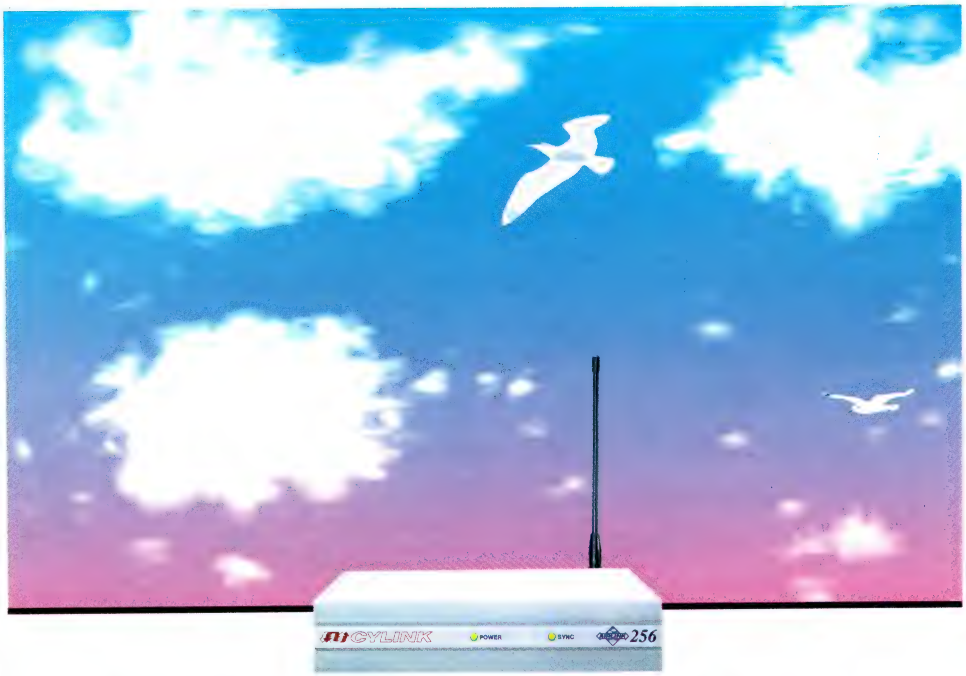
Other enhancements to the new version include better diagnostic information for system usage and status, and improved gateway performance.

Microsoft (02) 870 2200

Intel Personal Conferencing

Intel has introduced the new ProShare Personal Conferencing product family, which is a range of PC-based products which allow people to work together on documents, spreadsheets and other applications, and to see one another using videoconferencing.

The new family of products comprises a range of add-in boards which let users select from a range of conferencing



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options. ProShare Standard Edition allows two remote users to share a common work area on their PCs using a modem or the network. There is a tool set with pointers, markers, highlights and test tools, and a 'jumpstart' feature allows a user to launch the software with a colleague who does not have ProShare.

The software allows users to simultaneously annotate and edit documents, and to share document 'snapshots,' while a remote object linking and embedding facility allows changes to documents to be saved into the original applications.

The Extension Ringer differentiates the ring of different phones

ProShare Premier Edition also adds an application sharing feature, which can allow two people to share a software application, even if one person doesn't have the application.

ProShare is available for any Intel-based 386 or higher PC.

Intel (02) 975 3300

Phone Extension Ringer

Telecom has released a new accessory known as the Extension Ringer, which has variable volume, tone and pitch controls and comes with a 10 metre telephone attachment cord. The device is designed to alert someone to the sound of a phone ringing beyond its normal range, and help distinguish the sound of a particular phone from others in the vicinity.

The Extension Ringer can be attached to a normal phone or used as a station-based alarm on some Commander systems. It can also be wall-mounted, and comes with a modular adaptor and a 10 metre extension cord.

A nine-volt DC power adaptor is included, and the unit can also run on batteries. The unit sells for $59, comes with a 12-month warranty, and is available from major retail outlets, communications stores and Telecom Customer Centres.

Telecom Technologies
(02) 818 3888

Enhanced PC/TCP Software

FTP Software has released an enhanced version of its PC/TCP Network Software v.2.3 DOS/Windows.

The new version of the software now supports upper memory blocks, allowing users to load all or part of the TSR TCP/IP kernel into the UMB area, and fully utilise all free areas of conventional memory. IP multi-

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cast support has been added, making it possible to send data to a specific set or workgroup of users that may be spread across separate physical networks, on a LAN, or throughout the Internet. The package also now includes WTN3270, a Windows application for IBM 3270 emulation. WTN3270 provides a graphical keyboard remapper and support of extended attributes, providing users with full control over their IBM terminal emulation environment.

Other enhancements include improved Gateway Fallback, which automatically switches to a secondary router when a primary router fails; an improved NetBIOS that uses less than 14K of memory; a Windows Sockets DLL that is around 40% smaller; and Windows file transfer protocol to allow drag-and-drop of files to and from a remote host to a local PC.

PC/TCP Network Software version 2.3 DOS/Windows is available for $450.

NetArch (07) 393 1933

Accessory for Analogue Testers

Wandel & Goltermann has announced a new accessory which company officials say provides a simple solution for testing multiple switched 2-wire circuits.

The new VF Loopholding and Changeover Box, called the VLB-6, allows two switched 2-wire circuits to be tested simultaneously using one instrument.

The new unit provides two loopholding circuits (one for each 2-wire circuit), and a changeover switch which enables the generator and receiver connections to be changed over without disconnection from the circuit under test, according to company officials.

Wandel & Goltermann
(03) 690 6700

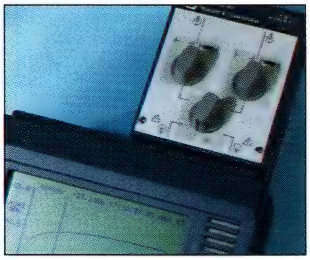
Sniffer Enhancements

Network General has announced enhancements to its Distributed Sniffer System (DSS) with Expert Analysis.

Integration with leading network management platforms has been added, as has the ability to export Expert Analysis information to third party applications, and expanded protocol support for both Expert Analysis and Protocol Interpretation. As well, Network General announced the introduction of SniffMaster Consoles for Microsoft Windows and HP UX.

DSS functionality can now be deployed from a wide range of integrated network management systems such as HP OpenView, Sun's SunNet Manager, and Novell's NetWare Management System. Officials said this lets network managers quickly target troubled segments for faster problem resolution.

New protocol support additions include Expert Analysis for AppleTalk and OSI, and Protocol Interpretation for Novell NetWare 4.0, Banyan VINES 5.5, SNMP v.2, X.400, X.500 and Sun NFS v.3.

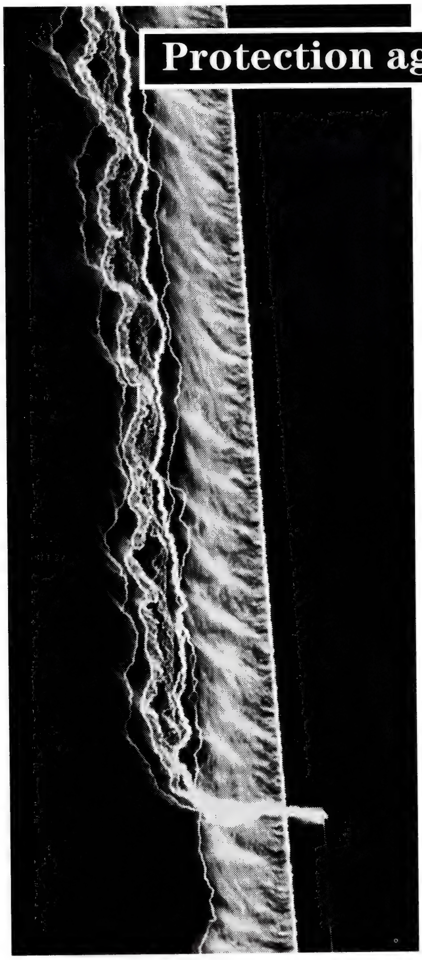


The VLB-6 can test two switched 2-wire circuits simultaneously

Additional new DSS features include improved capabilities to facilitate trend analysis, capacity planning and baselining. These features enable network managers to schedule the automatic transfer of Expert Analysis and Network Monitoring information from multiple segments to a central console for report generation.

The addition of DSS SniffMaster Consoles for Windows 3.1 and HP UX environments will also provide users with more flexible access to remote analysis resources from a range of hardware platforms.

Com Tech (02) 317 3088



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CRC-A487 OZ

The TP-10A interfaces Ethernet AUI nodes to 10Base-T UTP LANs

LAN Manager Upgrade

Microsoft has announced the release of the Microsoft Windows NT Advanced Server upgrade for LAN Manager.

The new version will enable LAN Manager users to upgrade from version 2.0 and higher servers. It will allow for the reliable transfer of user accounts and associated permissions, restoration of the LAN Manager environment (including Scheduled Commands, UPS, Shared Directories, Network Services, and Network Connections), backup data to tape or another network server, reliable file system conversion, upgrade services for Apple Macintosh, seamless implementation of a single network logon, and the ability to generate a log of all changes to enable network managers to validate the upgrade for completeness.

The upgrade is available for $965 to all users of LAN Manager for OS/2, LAN Manager for Unix Systems, IBM's LAN Server, and 3Com's 3+Open and 3+Share.

Microsoft (02) 870 2200

Miniature Transceiver

Australian manufacturer, INC, has announced the TP-10A miniature transceiver that interfaces Ethernet 802.3 AUI nodes to a 10Base-T UTP network.

The TP-10A offers 100% collision detection, jabber protection, loopback and SQE testing, allowing connection to Ethernet controllers and repeaters. It also provides automatic detection and correction of receive link polarity error and supports UTP cables to 100 metres.

The product comes with two diagnostic LEDs that indicate power and receive link status and assist with troubleshooting. The small size of the unit allows direct connection to the AUI port of the host device, eliminating the need for an external AUI cable. Additionally, the RJ-45 connector can interface directly to UTP telephone cables such as AT&T's Premises Distribution System.

The TP-10A sells for $140 (ex tax), or $1,330 (ex tax for a pack of 10).

INC Manufacturing (02) 645 2200

Rumba Tools for APPC

Datacraft has released the new Rumba Tools for APPC from US vendor Wall Data. The package is designed to enable Windows program developers to substantially reduce the time needed to write Advanced Program-to-Program Communications (APPC) transaction programs (TPs).

Officials said the program is easy to use, and can teach users about APPC programming, prototype TPs, and the use of TPs in live applications. It comes with a powerful APPC macro/scripting utility called VerbTalk, which lets users interactively script the conversation flow between TPs, and then either call the saved script or port the logic to the application.

The Dynamic Link Library enables the execution of TPs on the spot, while the Trace utility helps users to quickly identify logic errors in conversations.

The Configuration utility lets users define a session quickly, then save the settings in a reusable file. Users can specify connections, nodes, logical units and transaction program for each configuration, and connections via SDLC, Token Ring and Rumba Remote are supported.

Rumba Tools for APPC is priced at $2,115, and versions

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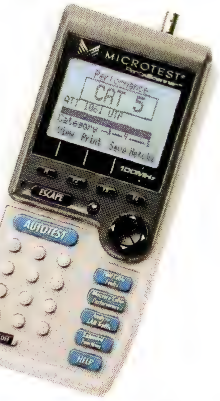

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are also available for use with Rumba for the Mainframe, and Rumba for the AS/400.
Datacraft (03) 727 9111

Mac Comms Software

Banksia Technology has recently announced it will bundle the new QuickLink II Fax for Macintosh 4.0 software package in with its fax/modems.

The new software integrates fax and telecommunications in one package, offering a wide range of features, Banksia officials said. Some of the fax features offered in Version 4.0 include: Modem Monitor Dashboard, which displays modem lights on the screen for monitoring internal modems; Autodetect fax/modem for easier installation; separate send and receive logs; fax view zoom from 25% to 900%; fax view rotate in 90 degree intervals and multiple view modes; selectable cover page fonts and point sizes; fully integrated text editor supporting multiple fonts, sizes and styles; the ability to directly fax PICT, TIFF, MPNT and text files; facsimile archiving; incoming call distinguishing for incoming fax/data ; and Rockwell Protocol Interface. The software also incorporates a powerful optical character recognition package which allows incoming fax messages to be converted into usable word processing files.

Enhancements to the telecommunications portion of the package include: Z-Modem file transfer; CompuServe B file transfer; user-configurable macro keys; fully integrated scripting language; drag and drop phone lists; and multiple phone books.
Banksia Technology
(02) 418 6033

Voice/Data Integration

The Micom Sprinter range integrates voice and fax with LAN traffic

Australian firm Datacraft has announced the release of the low-cost Sprinter family of products which enable the integration of voice and fax traffic to LAN/data traffic over an ISDN or low cost leased line.

The Sprinter range has been developed by US-based Micom Communications, and is available in a wide range of configurations. The products support the connection of virtually any device including a LAN bridge/router, PC, async terminal, cluster controller, host computer, printer, telephone, key system, PABX or fax.

Datacraft officials said that because of the ability to integrate voice and fax traffic with remote LAN or data traffic over a single ISDN or low-cost leased line, a Sprinter unit, which sells for around $3,000 in basic configuration, would pay for itself within months because of the savings due to reduced normal phone and fax toll charges.

The Sprinter range incorporates Micom's advanced speech compression technology to reduce voice/fax bandwidth requirements by up to 95% without affecting voice quality, said Datacraft officials. They added that the product reduces fax

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INC's FOIRL transceiver connects fibre optic cable to the AUI port

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Management can be performed locally via a menu-driven LCD/keypad; via an easy-to-use command line interface on an attached async terminal; or a number of Sprinters can be interconnected in a nested configuration and managed from a single terminal or PC.

Remote LAN traffic or sync traffic can be handled at speeds up to 64Kbps, and the Sprinter range also offers simultaneous data/voice communication over satellite links. Officials said that the low latency of the Sprinter products means they cause virtually no added delay to satellite communications.

Datacraft (03) 727 9111

FOIRL Transceiver

INC Manufacturing has introduced the new TP-20F FOIRL Transceiver, which allows users to connect fibre optic cable to the AUI port.

The unit has one 15-pin D-type connector for connection to the host, and two ST connectors for connection to the fibre optic cable. It is compliant with IEEE Ethernet 802.3 and Ethernet 1.0/2.0 specifications, and allows a network backbone to be extended by up to two kilometres, according to a spokesperson from INC.

The device, which can fit into the palm of a hand, allows a direct connection to the host, but if preferred, an AUI cable can also be used between the transceiver and the host. The unit features SQE functions, and provides LED indicators for diagnosis of the status of the network and the link integrity of the fibre. The TP-20F FOIRL Transceiver is priced at $460.

INC Manufacturing
(02) 645 2200

Windows in IBM Midrange Environment

IDE Technology has announced the release of IDEA's new communications software designed for use with its IDEAcomm family of products.

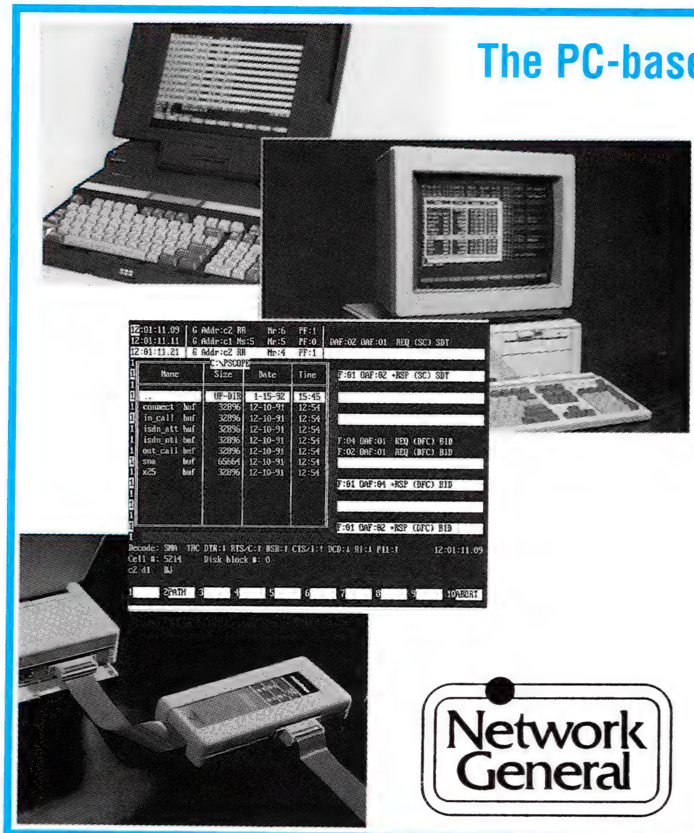
The new software, called the IDEAcomm Midrange Client, is an SNA client software package which is designed to address the networking needs of users of Windows-based PCs in an IBM midrange client/server environment.

The package gives PC users on a LAN who use IBM PC Support/400 for midrange host connectivity a graphical Windows-type environment on their PC. Company officials said it is easy to install, and supports IBM's Advanced Program-to-Program Communications (APPC), providing users with access to PC Support features on the AS/400 minicomputer simultaneously with PC applications.

IDEAcomm users are able to use AS/400 functions like file transfer or host printing services just as they would PC LAN services, said officials, adding that the software also features a range of new features designed to improve user productivity. For example, a new Copy & Paste feature allows users to selectively copy and paste text or bitmaps from the host to the PC applications without the need to edit or format after the information reaches the client PC.

The IDEAcomm Midrange Client is available for $520 for a single user licence, $3,750 for a 10-user licence, $8,650 for a 25-user licence, and $15,960 for a 50-user licence.

IDE Technology
(02) 899 9900



```
12:01:11.09 | G Addr:c2 RR      Nr:6  PF:1
12:01:11.11 | G Addr:c1 Ns:5   Nr:5  PF:0  DAF:02 OAF:01  REQ (SC) SDT
12:01:11.21 | 6 Addr:c2 RR      Nr:4  PF:1
              C:\PSCOPE
   Name          Size     Date     Time     F:01 OAF:02 +RSP (SC) SDT
 ..             UP-DIR  1-15-92   15:45
 connect   buf   32896  12-10-91  12:54
 in_call   buf   32896  12-10-91  12:54
 isdn_att  buf   32896  12-10-91  12:54     F:04 DAF:01  REQ (DFC) BID
 isdn_nti  buf   32896  12-10-91  12:54     F:02 DAF:01  REQ (DFC) BID
 out_call  buf   32896  12-10-91  12:54
 sna       buf   65664  12-10-91  12:54
 x25       buf   32896  12-10-91  12:54     F:01 DAF:04 +RSP (DFC) BID

                                            F:01 DAF:02 +RSP (DFC) BID
Decode: SNA  TRC DIR:↓ RTS/C:↑ DSR:↑ CTS/I:↑ DCD:↓ RI:↓ P11:↑        12:01:11.09
Cell #: 5214     Disk block #: 0
c2 d1   BJ

1      2PATH  3      4      5      6      7      8      9      10ABORT
```

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Telecoms Disparities and Telecoms Development: The View From PTC'94

Ten years ago, the Independent Commission for World Wide Telecommunications Development held a series of meetings in cities around the developing world. The 'Maitland Commission,' named after ICWWTD Chairman Sir Donald Maitland, reported its findings in a landmark report entitled *The Missing Link*. The report provided a comprehensive, unprecedented review and analysis of policies on communications development and a study of how to better stimulate the development of telecommunications infrastructures. Some of the findings were so dramatic and oft- cited that they have almost become telecoms cliches, e.g. there are more telephones in Tokyo than in all of Africa.

From the perspective of 1994, the tenth anniversary of *The Missing Link* report, it is difficult to appreciate the enormity of the tasks confronted by the Commissioners. Developing countries did not axiomatically consider telecommunications to be central to development. Developed countries, bilateral foreign aid programmes, and multilateral development agencies all exhibited a great deal of indifference to telecommunications. The telecoms industry itself contributed to the growing disparity between richer and poorer nations by emphasizing unduly expensive, state-of-the-art technology. What is now an immense market for low cost, simple and 'thin route' telecoms was largely undiscovered.

The major philosophical shift in our industry served as the theme for the 1994 Pacific Telecommunications Conference, PTC'94, held in Honolulu in January. The Conference theme was 'Forging New Links: Focus on Developing Economies.' Ten years after *The Missing Link*, PTC'94 analysed and assessed the state of telecoms development today, and provided a look at future directions.

In assessing the current environment, Sir Donald Maitland noted that "those who served on the Commission would undoubtedly by impressed by the progress made these past ten years in many parts of the world. In particular, they will have noted with satisfaction the extent to which the central message in *The Missing Link* has been received and understood, namely that no developing country, hoping to provide a better life for its citizens wherever they may live and work, can afford not to invest in a comprehensive and effective telecommunications network." While generally optimistic, Sir Donald Maitland noted that, in political terms, "the outlook worldwide can best be described as uncertain . . . It would be unwise to expect all these problems to be solved overnight. At the same time as the need for closer economic and commercial links between regions has been recognised, the reassuring political certainties of the second half of the century will increasingly be questioned."

> *"The low income countries still have less than a 5% share of global telephone main lines, whereas they are home to some 55% of the world's population."*

Dr Pekka Tarjanne, the Secretary General of the International Telecommunication Union (ITU), put forward a similar note of caution to the PTC'94 delegates: "The development gap between high and low income nations still persists in telecommunications. Nevertheless, there is some evidence that it has narrowed over time . . . However, the low income countries still have less than a 5% share of global telephone main lines whereas they are home to some 55% of the world's population. This disparity is unacceptably high in economic, social and humanitarian terms and the gap is narrowing too slowly . . . The telecommunications gap exists not only in *quantitative* terms but in *qualitative* terms. While it is true that the gap has narrowed in terms of the provision of basic telephone services, there is some evidence to suggest that the gap has widened in other areas, notably in the provision of advanced telecommunications services. Some advanced services — such as cellular radio, fax terminals, and Internet-based electronic mail — are already widely available in developing countries. But in each case, this represents mainly a consumer investment in terminal equipment rather than a public investment in infrastructure . . ."

One of the foremost means by which developing countries have secured major investments in telecoms infrastructure has been through strategic alliances, joint ventures, and innovative Build-Operate-Transfer or Build-Transfer-Operate schemes. The infrastructure in place to secure 'real' infrastructure development in areas such as telecoms is now quite sophisticated. As Peter Smith of the World Bank identified at PTC'94, those countries that have been most open to foreign technology are those that have progressed the fastest. Derek Burney, Chairman, President and CEO of BCE Telecom International, identified the need for national governments to work with the private sector to make a greater effort to update the 'international rules of the road' and ensure that international telecoms proceeds on a basis of cooperation. The 'network of networks' that arises should be an open one.

Will this network of networks really just encompass the wealthy countries and a few technological oases in poorer states? Several speakers at PTC'94 put forward the view that such an outcome is by no means inevitable. A paper by Canadian consultants John Gelbert and Ken Hepburn and Victor Skelpovy of Tara Shevchenko Kyyiv University, Ukraine, emphasised the challenges confronting countries just starting down the road to the information technology highway. Their paper focused on the countries of the former Soviet Union, most of which lack appropriate legal and regulatory frameworks and stability, and are subject to looming geo-political considerations. The CIS states, like Africa and other parts of the world, do not have the same glittering attractiveness to investors as even the poorer Asia-Pacific states. Nevertheless, the prospect of small-scale joint ventures and the advent of wireless low-earth-orbit (LEO) satellite communications offer unprecedented opportunities for these countries to leap frog ahead.

Part of the focus of PTC'94 was also to ask our panelists to estimate what the telecoms world of 2004 — ten years hence — might harbour for developing and developed States. The prospects put forward were quite optimistic. But there was general agreement that we are in the middle of a quick-moving transitional period, in which great disparities remain. This in fact bodes well for firms in developed countries seeking to work with developing country markets in reducing these disparities. Nowhere can it be said that telecoms is a 'bad investment' — quite the contrary, in fact. The development of telecoms infrastructure is now universal and omnipresent. The next ten years will, for most of the world's population, see the real information technology revolution. The fast pace of change will be disturbing and intimidating to many in our industry, but those who embrace it will be sure to profit.

James Savage is Associate Director of the Pacific Telecommunications Council and Editor of the Pacific Telecommunications Review.

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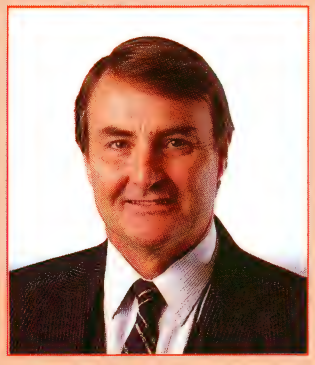

Editorial by Wally Rothwell

Review Must Begin This Year

One of the more enlightened decisions of the government in framing our more competitive telecommunications environment was to set a sunset date on the Telecom/Optus duopoly.

The terms of that sunset clause are that, on 30 June 1997, full interconnection between carrier networks is to be available to all Australians, so that 100% of the general carriers' customers may pre-select and change selection of carriers and that fully itemised billing is available to them.

After that date, the Minister of the day may grant a general carrier licence to one or more organisations, which may then compete directly with the current duopolists.

Clearly, the main benefit of the sunset clause was to provide Optus with the time and incentive to achieve rapid roll-out of its services and to establish itself firmly as a viable, credible competitor. In addition, an incentive was provided for Telstra to restructure so that it could achieve much-needed efficiency gains, to meet the demands and culture of a competitive market.

I happen to believe that Australia is embarked upon an evolutionary process towards full telecommunications competition that is the best of any country in the world. While I would much rather have seen the duopoly based on OTC than Aussat, we do have a strongly growing competitor to Telstra, whereas with full, open competition we would probably have seen a much slower take up of the competitive market, as has happened in other parts of the world.

Further, the other enlightened decision of government was to allow full, simple resale and we are now observing resellers such as AAPT, BT, Pacstar, QNET, Netex and others using leased capacity to carve niches in the market. By 1997, they will have the experience to know whether they want to become full competitors to the present duopoly.

So while I believe we are in a healthy transition stage to full competition, we cannot simply sit back and watch it happen. There are a number of factors which indicate that the time to start planning for the post-1997 era is during this year — 1994.

There needs to be some certainty about what will happen as we move towards the year 2000. Not only are the carriers and service providers making huge investments, but so too are major users as they restructure their telecommunications operations to take account of rapidly changing technology and competitive opportunities. Those investments need as much planning certainty as can be given.

One example of the uncertainty that exists is that, although the Minister may issue a new general carrier licence after 1997, no Minister yet has committed him or herself to any determination to encourage one or more general carriers at that time. (Of course, there needs to be an aspirant first!)

June 1997 is less than a mere $3^1/_2$ years away. A formal public review of the plan for our telecommunications future for the rest of this century must commence not later than the second half of 1994. One only has to look at the imponderables to realise some of the problems needing to be resolved. Take the almost inevitable privatisation of all or part of Telstra, for instance. A conservative government would have that high on its agenda, and there are persistent rumours that the possibility has not been dismissed by Labor either. The effect of full privatisation would raise a number of questions relating to the current regulation for competition and for universal service obligations.

We could have an election any time between late 1994 and early 1996, so it seems that it may be already too late for the present government to complicate its re-election chances by embarking on what would be a controversial project of privatisation. This may then be an area where uncertainty could be allayed.

That word 'convergence' we have all talked about and forecast for so long is now upon us. The introduction of broadband services and interactive Pay TV means that telecommunications, broadcasting and computer technologies will have become one, and the difficulties of sorting out the regulatory obligations of Austel, the Australian Broadcasting Authority and the Spectrum Management Authority will be complex.

The existence of the PMT (Packer Murdoch Telecom) consortium and Telstra's investment in Channel 7 not only indicate a shifting emphasis in the way the carrier sees its business opportunities, but they raise questions about who is to provide, and more importantly control, the telecommunications infrastructure of the future. One only has to look at the inroads made by Britain's cable TV companies on BT's telephone subscribers to understand what can happen.

ATUG would like to see Telecom sticking to its knitting and putting its main efforts into modernising its network. But, given the shifting emphasis on the way carriers worldwide are doing business, it is difficult to be highly critical of Telecom getting into the 'content' as well as the 'carriage' business.

The outcome of the Broadband Services Expert Group, set up by Minister Beddall, and hopefully encouraged by Minister Lee, may shed some light on the way the future PSTN is provided. Questions like: What are the costs? Who will pay? What are the technology uses and opportunities? What is the demand? all need to be answered.

Some studies are being undertaken to look into our telecommunications future. In addition to the Expert Group report, expected at the end of this year, the Bureau of Transport and Communications Economics is undertaking an 18-month 'Communications Futures' study, led by Chris Cheah, and Holly Raiche of the Communications Law Centre, is doing a study, which should be completed soon, of the lead up to 1997.

These will assist the upcoming review, which must be commenced under Minister Lee's guidance soon. ATUG, for its part, will air the subject during our annual conference, ATUG'94, to be held in Melbourne in May. It is always time to think about the future. For our telecommunications environment to the year 2000, the time to plan is now and the need is pressing.

Wally Rothwell
Executive Director

Ballot is a Fairer System

Telephone users in Brisbane, Adelaide, Perth, Hobart, Darwin as well as a number of regional centres will be invited to choose their preferred national and overseas long-distance carrier from March this year as part of the ongoing ballot process.

In Queensland, March 16 marks the date of when the ballot forms will be mailed to all users in Brisbane, the Sunshine Coast and the Gold Coast.

So far, users in Sydney, Melbourne, Canberra, Geelong and Mornington had their opportunity to vote between the long distance service provided by Telecom Australia and Optus Communications (see Table 1: 1993 Ballot Results).

According to Austel, the ballot process in 1993, which began with Canberra in July last year and has seen some 4.1 million ballot packs distributed, was a great success, providing Telecom and Optus with an equal opportunity to win customers and providing consumers with an opportunity to make an informed choice of telephone company for long distance and international calls.

ATUG and the Ballot

ATUG is an advocate of the ballot process. Making a choice of a long-distance carrier via a ballot process is beneficial to telephone users because they will not have to dial a prefix every time to make a call. Such a process of selecting a carrier is also considered to be a fairer way of giving the second carrier equal access to the market, because dialling an extra digit is seen as a disadvantage to Optus. In any case, Austel has directed that the ballot process is held and the Minister for Communications has shown no inclination to interfere in that decision.

Choice can be Changed

Users are reminded that their choice of a telecommunications carrier during the ballot process does not bind them forever to that carrier. Even after selecting one carrier, users will still be able to access the services provided by the non-selected carrier by dialling an override code before dialling the required telephone number.

The override code for Telecom is 1411 and for Optus is 1456. Override codes can be programmed into most touch phones so as to provide the equivalent of one digit access to the carrier not chosen. Users may also change their choice of long distance carrier altogether if they wish to do so. The first change within the first six months is free. Users will be informed about how they can arrange the change to be made.

To Vote or Not to Vote?

There has been a view expressed by some consumer organisations and unions that users should opt out of the ballot or just not vote. In that event, there may be less than a 65% response which could require a second ballot form being sent out to those non-voters who had not formally notified the Ballot Administrator that they preferred not to vote. A second ballot took place in Sydney and Melbourne. As far as ATUG is concerned, having a second ballot in the same region is an unnecessary expense. ATUG recommends that everyone should vote, regardless of their intention or the amount of their long distance traffic, as this limits the need for a second ballot and provides a more representative view of the market's attitude.

Nevertheless, users are not compelled to vote but can inform Austel, that they do not wish to vote or they can simply ignore the ballot. In either of these two circumstances they will remain Telecom users for long distance services unless they use the override code to access the Optus network on a call-by-call basis.

After Voting?

Users will be advised within 10 days of the ballot closing that their telephone number is linked to the carrier of their choice at their local exchange. Once this has taken place, users will no longer need or be able to use the 'Dial 1' option.

Table 1: 1993 Ballot Results

	Optus %	Telecom %	Response Rate%
Canberra	12	88	52
Sydney	18	82	58
Melbourne	14	86	56
Mornington	10	90	50
Geelong	10	90	55

Source: Austel

Users who have selected Optus as their long distance carrier will receive two accounts — Optus for their long distance traffic and Telecom for local calls and service rental (and any other equipment if provided by Telecom). However, due to some reports that Telecom has been slow to changeover users' telephone services to Optus after the ballot period, ATUG encourages its members to notify us if they find that their telephone services have not been changed over as requested.

Hotline Numbers

The hotline numbers for further questions on the ballot are:

Ballot Administrator	008 062 333
Telecom	008 626 008
Optus	008 500 500
ATUG	02 957 1333

Telecommunications Act on Disk

The new EIS Electronic Law Book now includes all the updates to the Telecommunications legislation along with Broadcasting and Radiocommunications legislation.

The publication, on a floppy disk, is available to ATUG members at the special price of $150 including postage and packaging — a saving of $50. A subscription including a further two updates is also available for the special price of $295 — a saving of $100.

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ATUG AUSTRALIAN TELECOMMUNICATIONS USERS GROUP

ATUG'94 Covers the Basics and Unravels the New

The short theme for ATUG'94 is *Smart Communications for Smart Business.* However, according to ATUG's chairman, George Maltby, the wider context for this year's conference is building and managing world class information infrastructures. "As 1994 will see the community discussion process for the development of a national consensus on convergence policy, I have added to this wider theme, the words: 'using converging technologies'," he said.

Thus, ATUG'94 is the forum where users will be able to learn what a digital super highway will mean for Australia. This year's industry conference will also encourage discussions about computer, broadcasting and telecommunications convergence — Pay TV, interactive video, multimedia, LAN-WAN connectivity and data management.

New features include a forum for telecommunications basics, a forum for open learning and ATUGnet, an exhibition-wide network for exhibitors to demonstrate their interoperability.

Telecommunications Basics Forum

This forum is designed for independent business operators, office managers and divisional managers or anyone who has to make decisions about telecommunications and computer spending. It looks at:

- How to deal with Optus and Telecom over your bill;
- How to cut costs on your telephone bill;
- How to choose between carriers;
- How to use broadcast fax and new mobile services; and
- How to protect corporate and individual privacy in computer and telecommunications environments.

Open Learning Forum

The purpose of this forum, chaired and directed by ATUG Director, Julie Carr, also the General Manager of Open Learning Technical Corporation, is to provide insights into the significant impact of telecommunications on open learning and the complex, related issues that educational leaders and key, national groups are now confronting. This forum is designed for educators at the policy and management levels, who need to be well informed about the growing impact of telecommunications on education. It will also suit industry providers who will benefit from this succinct distillation of issues and opportunities in the sizeable Australian education telecommunications market.

ATUGnet

This year will see the introduction of ATUGnet, the first exhibition-wide network on which exhibitors will be actively demonstrating their interoperability. Data networking has never been displayed so graphically in this region and it will create enormous interest for ATUG'94 visitors.

All in all, ATUG'94, to be held during May 2-5, will provide users in Australia the opportunity to sharpen their skills and improve their vision for the future.

ATUG Welcomes Austel's Number Portability Inquiry

ATUG has been advocating the practice of 'number portability' so that users are able to keep telephone numbers without the expense of additional costs, and other problems that would result from being allocated a new number, to accommodate each change in telephone companies.

To date, number portability is only available with analogue AMPS mobile services. This allows 018/015 analogue mobile phone users to change carriers without having to change their mobile telephone number.

Number portability has been made available to users of the analogue mobile phone service because both Telecom and Optus use the same mobile network. However, number portability has not been made available to other telecommunications services because Austel wants to take into consideration all potential technical complications and cost implications of implementing such a practice. This is why this year Austel has embarked on a study into the matter.

The three areas being investigated by Austel for the provision of number portability are:

- Special service numbers (for example, 1800/1900/13 numbers);
- Digital mobile numbers; and
- Blocks of public switched telephone network numbers without geographic relocation (or where those numbers do not have geographic significance with or without geographic relocation).

Indeed, ATUG has undertaken a detailed study of the process for achieving portability of special service numbers such as in the 1800 and 13 ranges. Our study forms a very important building block for Austel in determining both the implementation method and schedule for introducing number portability.

A Small Cost

After having considered the technical factors associated with number portability of switched telecommunications services as well as having analysed the costs of providing number portability in Australia, our study found that to introduce number portability for toll-free number services would cost the carriers less than half a cent per call. Similar small costs would apply to portability for recorded and live information services, and for special network services. In the case of portability for digital mobile services, the cost to mobile carriers for full portability for digital services would be less than one cent per call.

We feel that these costs are a small price to pay for the benefits of lower tariffs, better services and choice, and so we welcome Austel's use of the findings of our study as a basis of its own inquiry.

ATUG AUSTRALIAN TELECOMMUNICATIONS USERS GROUP

What Did ATUG do for Users Last Year?

A fair deal is what ATUG is best at achieving for its members.

Last year, many would have thought that competition was alive and well in Australia's telecommunications industry — but we discovered otherwise and thus pursued matters so that users could receive better services at lower prices.

Thus, during 1993, from ATUG's endeavours:

- For PABX users, Telecom is now considering a new charge structure for in-dial services and this is expected to result in significant savings;
- For users of White Pages directory services, the rules for charging have now been simplified to allow listings of various phone numbers at no charge (subject to conditions);
- For users wanting to change carriers, Austel is inquiring into number portability so users will not be penalised with additional costs when they want to change carriers;
- For the industry, after conducting its very own network management survey, ATUG was able to tell the industry what users' key needs were, and how well they were being served;
- For telecommunications training requirements, ATUG supported the formation of the Telecommunications Industry Training Advisory Board to overcome perceived gaps in the training available for the industry;
- For long-distance callers, ATUG sought amplification of Telecom's Extended Untimed (Local) Call Areas scheme;
- For users' complaints to be heard, ATUG called for the establishment of a suitable mechanism for telephone directories complaints; and ATUG supported the formation of the Telecommunications Industry Ombudsman as a means of having consumers' complaints aired;
- For users' protection, ATUG is investigating ways of protecting users from potential financial losses caused by toll fraud because we feel it is the industry's obligation to protect users by providing an environment which discourages and penalises crimes.

ATUG's long term goal is to ensure that the sunset clause on the duopoly heralds more widespread competition after 1997. This is why during this year, ATUG will be concerned with issues such as more competition, convergence and Telecom's continual restructuring.

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- ⇒ One year's free subscription to the monthly ATUG newsletter, 'Newsbrief';
- ⇒ One year's free subscription to *Australian Communications*;
- ⇒ Discount rates to the telecommunications event of the year, ATUG's annual four-day conference and exhibition, ATUG '94;
- ⇒ Discount rates to ATUG seminars and workshops;
- ⇒ Free admittance to ATUG special member meetings;
- ⇒ Free assistance on matters concerning telecommunications;
- ⇒ Representations of your views to Austel and the Government;
- ⇒ A forum to exchange ideas with your peers in the industry;
- ⇒ A telecommunications library service;
- ⇒ Member rates for ATUG products and services;
- ⇒ Free legal advice from ATUG's Legal Line service; and
- ⇒ An overall saving on your next communications bill due to ATUG's lobbying activities.

If you have any queries about your ATUG membership, call ATUG's business manager, Owen Richards, on (03) 690 6395. Members in Queensland may contact ATUG's business manager, Ray Poon, on (07) 870 4484. Members in Western Australia may contact ATUG's WA business manager, Geoff Groves, on (09) 450 3485.

One-Day Workshop

BEST PRACTICE IN COMMUNICATIONS MANAGEMENT

One of a continuing series of ATUG workshops for 1994

Business Skills for Communications Professionals in the Competitive Environment

Another ATUG Member Service

ADELAIDE . . . . Monday 21 March
. . . . Hindley Parkroyal, 65 Hindley St, Adelaide

PERTH . . . . Tuesday 22 March
. . . . Perth Townhouse Travelodge, 778 Hay St, Perth

CANBERRA . . . . Thursday 24 March
. National Convention Centre, 31 Constitution Ave, Canberra

BRISBANE . . . . Friday 25 March
. . . . Brisbane Parkroyal, Cnr Alice & Albert Sts, Brisbane

MELBOURNE . . . . Monday 28 March
. . . . . Parkroyal Melbourne, 111 Lt Collins St, Melbourne

SYDNEY . . . . Tuesday 29 March
. . . . . . Manly Pacific Parkroyal, 55 North Steyne, Manly

HOBART . . . . Wednesday 30 March
. . . . Salamanca Inn, 10 Gladstone St, Hobart

Cost: $420 for ATUG members;
$580 for non-members

ATUG Legal Line Service

Members should take advantage of ATUG's Legal Line Service. The service is run by ATUG director and chairman of ATUG's Legal sub-committee, Gerald Wakefield.

Members with legal queries regarding international telecommunications law and regulatory policy; radiocommunications; broadcasting and satellite law and policy; computer technology law; and intellectual property law are advised to seek this communications legal advice service by calling ATUG on (02) 957 1333.

ATUG Workshops For 1994

ATUG is offering members a series of one-day workshops in 1994 with a focus on translating the use of technology into providing support for corporate goals within the new competitive environment.

The workshops ideally suit any person concerned with telecommunications who needs insight into the way business practices are changing within the industry through deregulation.

The first in the workshop series is titled 'Best Practice in Communications Management.' It features an interactive, management-oriented session on a range of issues essential for the modern communication professional.

The six modules included in this workshop are:

- *Best Practice for the Communications Manager,* which covers management issues, success determinants, the new context and how to re-focus;
- *Benchmarking* covers concepts, measurements and benefits;
- *Outsourcing* looks at the risks and alternatives;
- *Planning* provides a seven-step guide to effective long-range planning in the communications technology context;
- *Staffing* considers the objectives, requirements, tasks and roles;
- *Funding and Cost Control* defines end user services, their dimensions and provision costs.

The facilitator is Amos Aked Swift Pty Ltd's senior consultant, Brian White, who specialises in strategic planning, benchmarking and communications management. He has also been the author of the management column in *Australian Communications.*

An Eligible Seminar

Members should note that the seminar is a structured training program in terms of the *Training Guarantee Act 1990* and where attendance is to develop, maintain or improve employment-related skills, it should qualify as eligible training under the Act.

Forum Gives MEI Green Light For Frame Relay

The Frame Relay Forum has finalised agreements for an interface standard for high-speed, wide-area connectivity technology called Multiprotocol Encapsulation Implementation (MEI) over frame relay.

The MEI standard provides efficient connectivity savings when many protocols are transported over the same logical link.

MEI gives to all data terminating equipment, such as bridges and routers, a standard means of identifying these protocols. This enables appropriate routing and call treatment to ensure efficient transport.

According to the Forum's president, Alan Taffel, frame relay has proven to be an efficient, reliable technology with numerous benefits to the user, as indicated by the consistent growth in the number of frame relay applications in many of today's industries.

"The release of finalised MEI agreements means frame relay is an even more robust solution for users who are looking for higher-performance wide area networks. Often, these users are operating multiple data networks with a variety of protocols such as IP, SNA and IPX. These agreements establish a procedure for transporting a host of protocols over Permanent Virtual Circuits, so that bridges and routers can interpret and differentiate between them," he said.

Enhanced Attractiveness

The MEI agreements enhance the attractiveness of frame relay as a very efficient transport mechanism by standardising frame relay's ability to transport or 'encapsulate' a variety of protocols within the frame's information field and transporting them at the network layer.

While contained within the field, the native protocol is shielded from network interpretation that otherwise would diminish performance.

The agreements also recognise all popular industry protocols to deliver a common means of transport, as devices in an industry-wide, multivendor environment must share a common network layer protocol to properly interoperate across a frame relay network. The Forum's technical committee is working to ensure that these MEI agreements are accepted as parts of ANSI, CCITT and ISO standards.

For More Information

The Frame Relay Forum is a non-profit corporation dedicated to promoting the acceptance and implementation of frame relay based on national and international standards. Forum membership is open to service providers, equipment manufacturers, users, consultants and other interested parties. For additional information, contact Linda Clarke, chairperson of the Aust/NZ chapter of the Frame Relay Forum, on (02) 975 2582.

ATUG Network Management Survey

Copies of the report of ATUG's Network Management Survey are still available — but not for too long! The complete report, including quantitative data, runs to over 40 pages together with well over 60 pages of supporting information and suppliers' responses. The report is available at $125 (including postage and handling) to ATUG members; and at $200 to non-members. For copies of either the complete report or the Executive Summary, please complete the form below:

Please forward ______ (qty) copies of the ATUG Network Management Survey at $125 for each copy ($200 non-members) for which I enclose payment of: $______

Please tick payment method (DO NOT send cash):

☐ **Cheque** ☐ **Mastercard** ☐ **Bankcard** ☐ **Visa**

Cheques should be made payable to ATUG.

Credit card number:

☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

Expires: ________ Cardholder's Signature: ____________

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OR:

☐ **Please provide a copy of the six page Executive Summary, free of charge to ATUG members only.**

Name: . . . .

Tel: . . . .

Fax: . . . .

Forward to:
ATUG
Network Management Survey
PO Box 357
Milsons Point
NSW 2061

THE DATA AND TELECOMMUNICATIONS MANAGEMENT MAGAZINE

Why not get the WHOLE story on networking?

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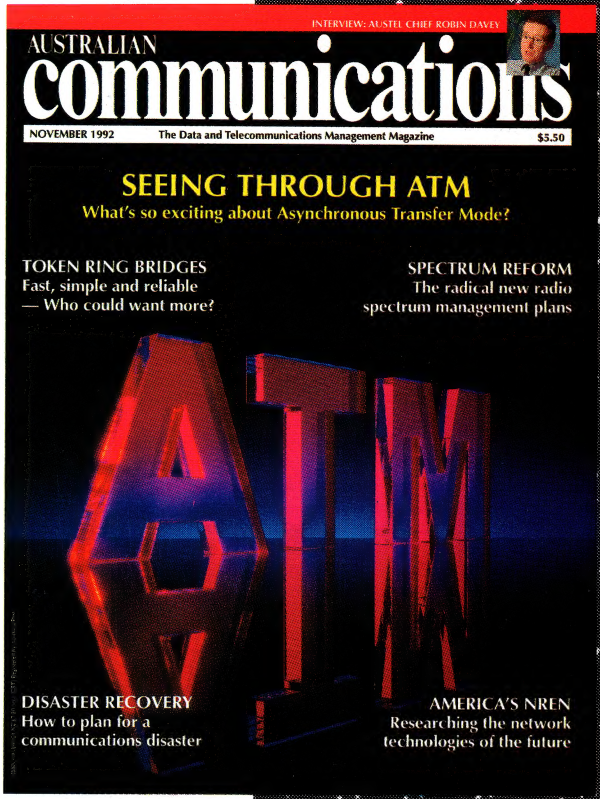

INTERVIEW: AUSTEL CHIEF ROBIN DAVEY

AUSTRALIAN communications

NOVEMBER 1992 The Data and Telecommunications Management Magazine $3.50

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OR: **Fax your application to us on (02) 264 2244**

CALENDAR

March

7-9 **Internetworking**, Ritz Carlton Hotel, Sydney. Issues covered in this event include OSI and multiprotocol networks; the competition for dominance between SNA, TCP/IP and OSI; connecting PC-LAN servers; capacity planning for client server environments; broadband networking; VANs and alternatives to private networks; and management of multiprotocol networks. There will be an optional one-day workshop which looks at internetworking cost and management issues. Fee: Two-day conference $1,395; conference and workshop $1,995; workshop only $795. Enquiries — AIC Conferences Tel: (02) 210 5700 Fax: (02) 221 7773.

10-13 **Telemex '94 and Elec-com '94**, Putra World Trade Centre, Kuala Lumpur. The Telemex '94 exhibition will display state-of-the-art business automation and telecommunication systems, while the Elec-com '94 exhibition is targeted at the rapidly growing market of electronics and computer users, and will feature the latest products in these fields. Enquiries — Excel Exhibitions Tel: +60 3 244 0669 Fax: +60 3 244 0670.

16-17 **Service Providers in the Mobiles Market**, Ritz Carlton Hotel, Sydney. The new competitive Australian environment will open the way for the entrance of service providers into the market. This conference brings together the three mobile carriers as well as service providers, dealers and suppliers to examine how the mobile market will change; the resale market for mobiles; the implications for customer service; and how the new digital services will be sold to the customer. Fee: $1,395. Enquiries — AIC Conferences Tel: (02) 210 5700 Fax: (02) 221 7773.

21-22 **LAN-WAN '94**, Hotel Inter-Continental, Sydney. This 3rd annual conference aims to keep delegates abreast of the latest technologies in the fast-changing world of local area and wide area networks. A forum of international experts will present new developments and applications in networking protocols, and examine technologies such as remote boundary routing, switched internetworking and wireless LANs. An optional half-day workshop will present the latest strategies in network management. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

21-23 **Mobiles '94** Hyatt Kingsgate, Sydney. This event will focus on all the critical issues surrounding the latest technologies and applications in GSM, PCS and CDMA, and will be presented by representatives from the carriers, leading consultancies, equipment vendors, regulatory bodies and government departments. There is also a full day workshop on CDMA technology, covering RF design issues, recent trials, systems and services, and the tools available for the design of CDMA systems. Fee: Conference and workshop $1,895; two-day conference only $1,395; any single day only $795. Enquiries — IIR Conferences Tel: (02) 929 5366 Fax: (02) 959 4835.

21-29 **World Telecommunication Development Conference**, The Sheraton Hotel, Buenos Aires. This conference, organised by the ITU, is aimed at high-level decision-making representatives of governments, regional and international developments and telecommunications organisations, multilateral funding agencies, and senior executives from large corporations planning international joint ventures and new business development. Enquiries — ITU Tel +41 22 730 5498 Fax: +42 22 730 5484.

28-29 **Understanding and Implementing Asynchronous Transfer Mode**, Hotel Intercontinental, Sydney. This event covers a range of topics including improvements in LAN and WAN architecture, using public broadband services to improve communications efficiency, using interactive audio/video links to develop 'virtual classrooms', and ways to interconnect WANs and LANs to create information superhighways. Fee: $995. Enquiries — IBC Conferences Tel: (02) 319 3755 Fax: (02) 699 3901.

April

11-15 **Investments and Joint Ventures in Asia-Pacific**, Hotel Intercontinental, Sydney. Aimed at the development of international alliances and investments, this summit will bring together leading personalities, senior-level investors, bankers, financiers and business leaders from the computer, communications and telecommunications sectors from a wide range of countries within the Asia-Pacific, North America and Europe. Enquiries — IC&C World Leaders Council Tel: +1 703 476 0664 Fax: +1 703 476 2924.

13-15 **Voice '94**, Golden Gate Hotel, Sydney. This event consists of three separately bookable days that each focus on specific issues of voice communication. Speakers will discuss how their organisations manage, design and maintain their voice communications and CPE, and participants will learn how they can cut their company's telecommunications costs and improve the delivery of communications services. Fee: $895 for any single day; $1,395 for two days; $1,995 for three days. Enquiries — AIC Conferences Tel: (02) 210 5777 Fax: (02) 221 7773.

13-15 **National Convergence Symposium '94**, Hotel Inter-Continental, Sydney. This event will focus on issues raised by the imminent convergence of telecommunications, computing and broadcasting, such as how a national information superhighway might be used and the issues for competition, royalty tracking for intellectual property issues, market responses to technology options and the implications for regulation, and organisational strategies to take advantage of the new interactive network. Fee: $1,895. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

18-20 **India Telecommunications '94**, Holiday Inn Crowne Plaza, New Delhi. This conference is designed to help telecommunications professionals identify and assess opportunities provided by the recent deregulation of the Indian telecommunications market. Overseas attendees can learn about the possibilities for foreign investment, joint ventures and international cooperative developments, and how they can benefit from policy reforms and restructuring of the Indian telecommunications sector. There will also be an exhibition accompanying the conference. Fee: $US1,895. Enquiries — IIR Conferences Tel: +852 549 5618 Fax: +852 547 3836.

25-28 **The Second Annual Pan Asian GSM Summit**, Kowloon Shangri-La Hotel, Hong Kong. This three-day conference with optional one-day workshop aims to keep communications professionals up-to-date with recent developments in the adoption of GSM throughout the region. There will be a wide range of high-level international speakers encompassing all aspects of the GSM market — technology, standards-making, government regulation and carriers. The workshop will be conducted by a group from the ETSI Technical Committee, Special Mobile Group. Fee: Four days $US2,495; three-day conference only $US1,895; workshop $US995. Enquiries — IIR Tel +852 549 5618 Fax: +852 547 3836.

25-29 **Africa Telecom**, Cairo International Conference Centre, Cairo. This event will attract the industry's leading speakers and 150 exhibitors from around the world. The theme for this year's conference is 'Integrating Africa Regionally and Globally,' and will cover telecommunications financing and investment in Africa, regional tariff structures, infrastructure development and broadcasting and technologies for remote areas. Africa and the Middle East region is an important telecommunications market, with an estimated demand for new telephone subscriber lines of 16 million and predicted investments of $US24 billion before the end of the century. Fee: SFR1500. Enquiries — ITU Africa Telecom 94 Forum Tel: +41 22 730 5811 Fax: +41 22 730 6444.

May

2-5 **ATUG '94**, Royal Exhibition Buildings, Melbourne. With the theme of 'Smart Communications for Smart Business,' the 11th annual exhibition and conference of the Australian Telecommunications Users Group will feature a variety of international and domestic speakers and exhibitors. A special emphasis will be placed on data networking in Australia. Enquiries — ATUG Tel: (02) 957 1333 Fax: (02) 925 0880.

June

8-11 **CIETE '94**, Shanghai Exhibition Centre, Shanghai. The 4th International Electronic and Telecommunications Exhibition and Conference on Communication Technology will present the latest products and trends in telecommunications and electronics. Enquiries — Worldwide Conventions and Expositions Tel: +852 375 7721 Fax: +852 375 0686.

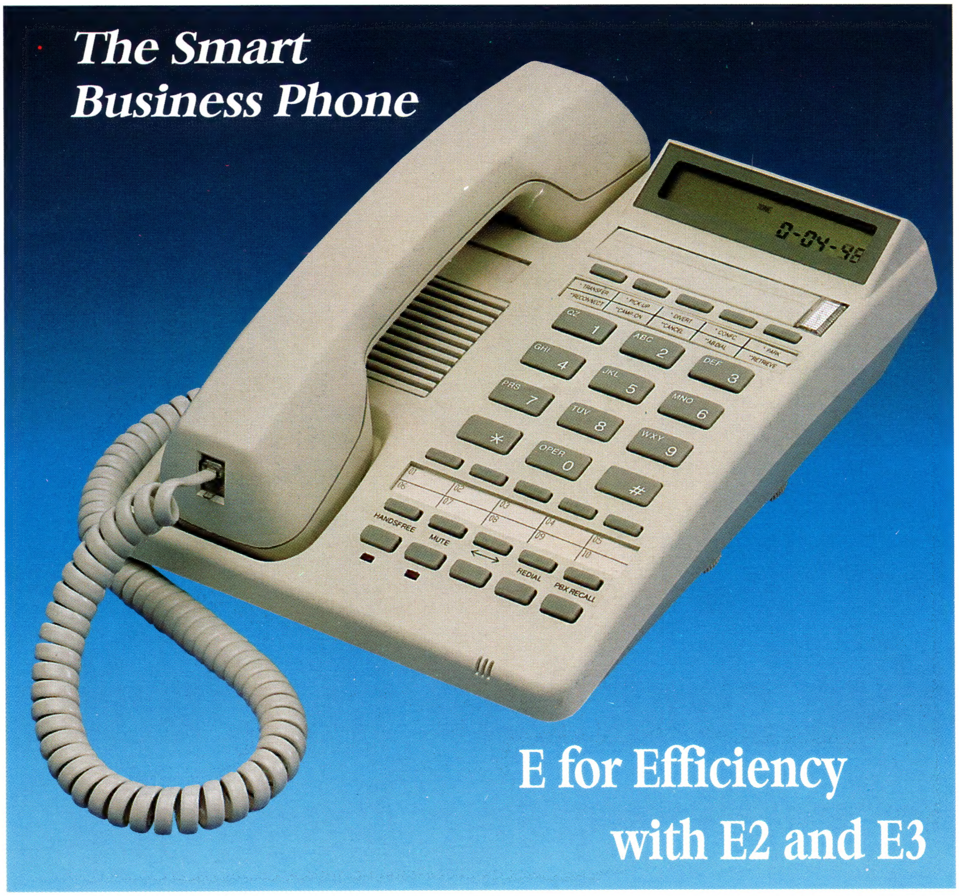
July

1-5 **Telecom China '94 Telecommunications Equipment Exposition**, Guangzhou International Exhibition Centre, Guangdong Province. This exhibition provides an opportunity for overseas companies to gain wide exposure in the lucrative and fast growing Chinese market. Enquiries — Union Fair and Trade Development Tel: + 86 20 888 2823 Fax +86 20 884 9074.

3-6 **International Telecommunications Society 10th Annual Conference**, Sydney Convention Centre, Darling Harbour, Sydney. This year's conference will look at the convergence of telecommunications, mass media and computer technologies brought about by developments in intelligent interconnected systems. The event will focus specifically on the areas of broadband infrastructure and user requirements; regulation of the industry; competition issues; and the contribution of telecommunications to economic growth. Enquiries — Donald Lamberton, ITS Tel: (06) 249 3884 Fax: (06) 249 0312.

October

25-28 **Communications India**, Pragati Maidan, New Delhi. This trade show will display a full range of telecommunications hardware and software in the areas of voice, data, text, visual display and radio. An associated technical conference will examine cellular mobile, networking, rural telephony and network privatisation. There will also be keynote presentations by the ITU, UNIDO, the World Bank, the Indian Department of Telecommunications and the Telecom Equipment Manufacturers Association of India. India is one of the fastest growing telecommunications markets worldwide. Enquiries — Exhibitions India Tel: +91 11 462 2710 Fax: +91 11 463 3506.



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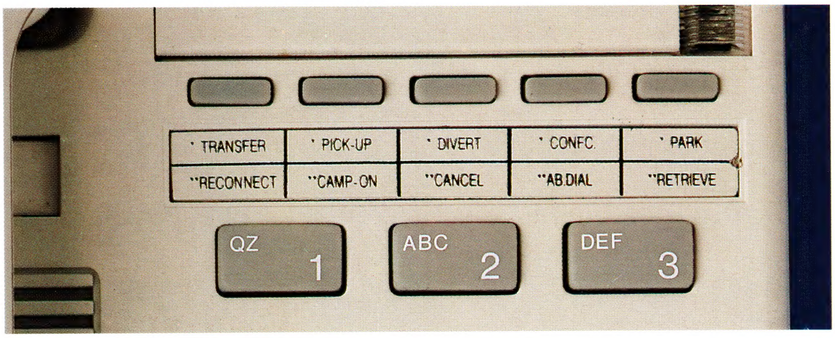

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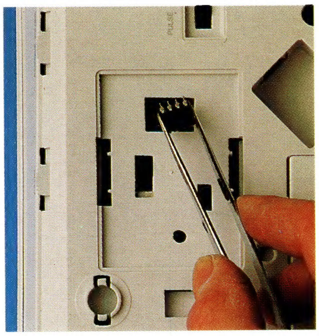

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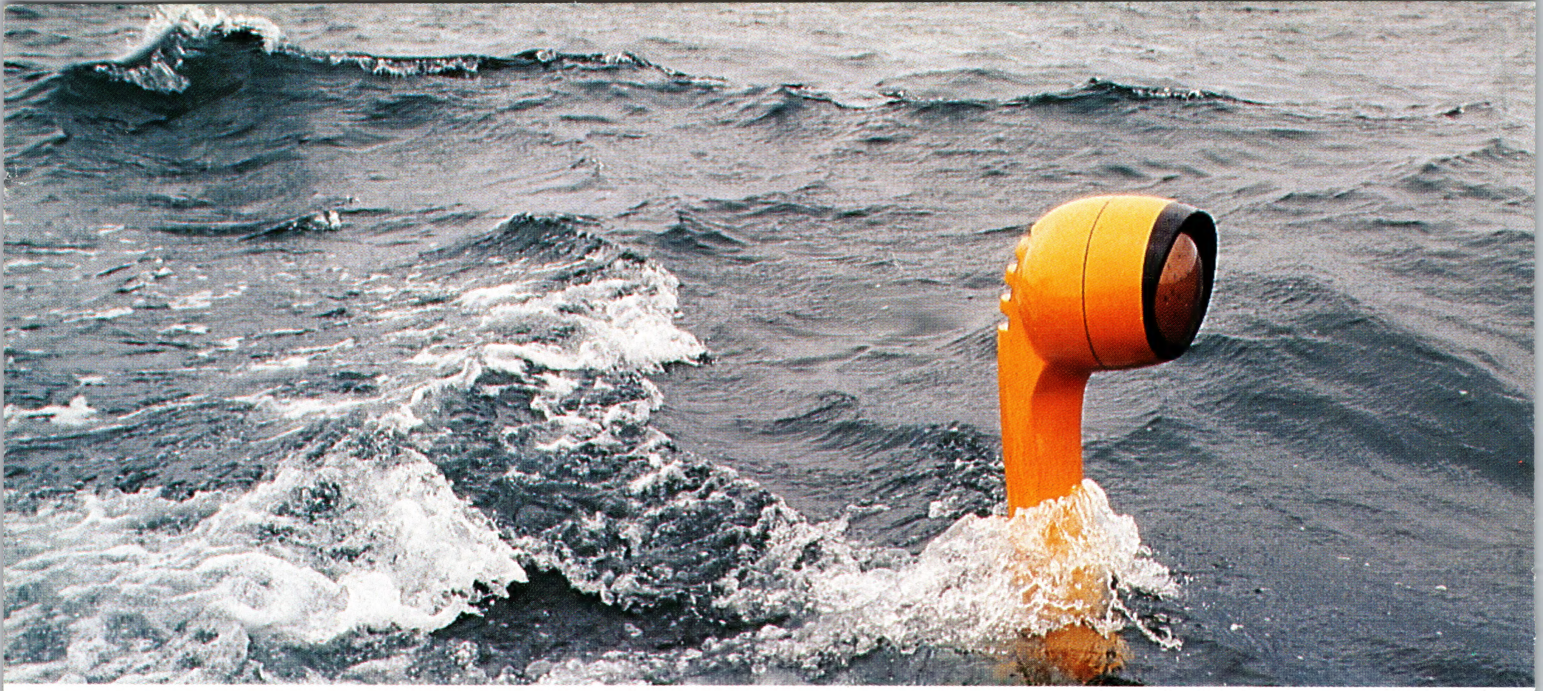

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